RC 970 G83 v.31 no.4
Biological & Medical Serials

No. 4. October, 1918. Vol. XXXI.

Journal

OF THE

Royal Army Medical Corps

Biological & Medical Serials
STORAGE

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUT.-COLONEL D. HARVEY, C.M.G., R.A.M.C.

ISSUED MONTHLY

Printed and Published by

JOHN BALE, SONS & DANIELSSON, LTD.

OXFORD HOUSE

83-91, GREAT TITCHFIELD STREET, OXFORD STREET, W. 1.

Price Two Shillings net.

Tested and Approved in Accordance with L.G.B. Requirements.

GALYL IS THE SAFEST OF ALL ARSENICAL COMPOUNDS IN SYPHILIS

(*Vide* Presidential Address, British Pharmaceutical Conference, July 10, 1918.)

INTRAVENOUS. **INTRAMUSCULAR.** (in Glucose).

Identical in Dose and Efficacy.

GALYL is as effective as SALVARSAN or NEOSALVARSAN on Spirochætes and Trypanosomes, more rapid in action, and free from the neurotropic and congestive action of these preparations.

300,000 Injections administered in **Naval, Military, and General Hospitals,** have demonstrated that **Galyl is efficient, rapid, and well tolerated.**

400,000 Injections of Galyl **are now given annually.**

Intravenous GALYL.

STAFF SURGEON reports:

"No case has given the slightest cause for anxiety, and the clinical results are very satisfactory."

Intramuscular GALYL.

May 29th, 1918.

DEAR SIRS,—I have now given over 700 injections (Intramuscular Galyl), with not one ill result. The Clinical results are very good—better, I consider, than any other Salvarsan substitute, and with the Glucose suspension the technique is quite simple.

Yours truly, Dr. ———.

MALTA FEVER. Doses: 0·10, 0·15, 0·20, 0·25, 0·30, 0·35, 0·40. **FRAMBŒSIA.**

HECTARGYRE

(Mercurial Salt of Hectine.)

As a treatment following Galyl, or *ab initio* in all stages of syphilis, Hectargyre is very effective and rapid; it is well tolerated even where prolonged treatment is necessary; the most intractable cases have yielded highly satisfactory results.

Hectargyre is supplied in sterile ampoules for intramuscular injections.

Ampoules A containing—
Hectine 10 c.g. } in 1 c.c.
Hg. 1 c.g. }

Ampoules B containing—
Hectine 20 c.g. } in 1 c.c.
Hg. 1½ c.g. }

Pills containing—
Hectine .. 10 c.g.
Hg. Protoiod. . 1 c.g.
Opium Extract 1 c.g.
(In phials of 24 pills.)

ABORTIVE TREATMENT OF GONORRHŒA.

Analgesic **Antiseptic**

IODARGOL

Painless **Non-toxic**

Colloidal Iodine suspended in sterilized oil with a hydro-carbon of the camphenic series.

It possesses simultaneously the properties appertaining to iodine and those which result from the colloidal state, hence its antiseptic and bactericidal power is enhanced. It is not only painless but actually analgesic.

FORMS: In Ampoules and Phials for Injection; also in **SOLUBLE BOUGIES and UTERO-TOPIQUE.**

Iodargal External for Wound dressing. More effective than Iodoform, Iodine solution, or Tincture of Iodine, but having none of their disadvantages.

18/8/17. B.E.F.

DEAR SIRS,—I am interested in Iodargol for use in the treatment of Gonorrhœa. Kindly send me on some ampoules, syringe, and a few bougies. I have a few cases here and would like to try them. I will send cheque as soon as I get your bill.

Yours sincerely, Capt. ———, R.A.M.C.
B.E.F. France. 4/9/17 B.E.F.

DEAR SIRS,—Enclosed please find cheque for amount due. I am very satisfied with the Iodargol.

Yours sincerely, Capt. ———, R.A.M.C.
B.E.F. France.

Literature, Clinical Reports, and Price Lists on Request.

The Anglo-French Drug Co., Ltd., Gamage Building, Holborn, London, E.C.1

Telephone: Holborn 1311. **Telegrams: "AMPSALVAS, LONDON."**

WEST END DEPOT: **MODERN PHARMACALS, 43, Mortimer St., W. 1.** Telephone: MUSEUM 564.

ADRENALIN

The hæmostatic and blood-pressure-raising principle of the suprarenal gland, as first isolated in 1900 by TAKAMINE, and placed on the market in January, 1901, by PARKE, DAVIS & Co.

FOR USE IN SURGERY:

ADRENALIN CHLORIDE SOLUTION.
The supreme agent for restoring animation in cases of shock or collapse. Also for controlling surgical or traumatic hæmorrhage.

ADRENALIN GAUZE TAPE.
A valuable hæmostatic dressing, swab or tampon. In sterile air-tight glass jars.

ADRENALIN TABLETS,
1/200 and 1/65 grain.
One tablet in 5 minims or 1 c.c., respectively, of sterile distilled water forms 1 in 1000 solution.

ADRENALIN AND BENZAMINE (EUCAINE) TABLETS.
One tablet in 1 to 5 c.c. of sterile distilled water forms a local anæsthetic and ischæmic solution for use in dentistry and minor surgery.

ADRENALIN AND COCAINE TABLETS.
Three strengths, respectively containing 1/300, 1/400 and 1/600 grain of Adrenalin with 1/6, 3/4, and 1/6 grain of cocaine hydrochloride. For preparing ischæmic and analgesic solutions for infiltration anæsthesia.

"CODRENINE."
A solution containing 1/1000 grain of Adrenalin chloride and 1/6 grain of cocaine hydrochloride in each c.c. For use in dentistry and minor surgery.

"EUDRENINE."
A solution containing 1/2000 grain of Adrenalin chloride and 1/6 grain of benzamine (eucaine) hydrochloride in each c.c. For use in dentistry and minor surgery.

FOR USE IN MEDICINE:

ADRENALIN Solution, Inhalant, Lozenges, Ointment, Suppositories and Tablets.

Employed with success in the following as well as numberless other conditions:

Asthma.	**Coryza.**	**Epistaxis.**	**Hay Fever.**	**Pruritus.**
Cholera.	**Dysentery.**	**Hæmatemesis.**	**Œdema.**	**Purpura.**
Conjunctivitis.	**Enteric Hæmorrhage.**	**Hæmorrhoids.**	**Otitis Media.**	**Varicocele.**

PARKE, DAVIS & CO., 50, Beak St., LONDON, W.

LISTERINE

is a very successful

SURGICAL DRESSING.

An American Surgeon, of wide experience, in a paper entitled "Wet Antiseptic Dressings," says:

> "I am absolutely confident any wound, treated by the method I describe, within a few hours of infliction, will never suppurate; it will control infections and its adoption would save thousands of lives." (Copy of paper may be had upon request.)

Listerine is composed of volatile and non-volatile antiseptics. Its employment affords prolonged and trustworthy antiseptic influence without harmful effect upon healing tissue.

LAMBERT PHARMACAL COMPANY

2101 Locust Street **St. Louis, Mo., U. S. A.**

British Agents: S. Maw, Son & Sons, 7, Aldersgate St., London, E.C. 1.

Royal 8vo. Pp. xvi + 623, with 373 Original Illustrations and 8 Coloured Plates. Price 30s. net.

WAR SURGERY

From Firing-Line to Base

BY

Major Basil Hughes, D.S.O.,

R.A.M.C., M.A., M.B., B.C., B.Sc., F.R.C.S.

AND

Captain H. Stanley Banks, R.A.M.C.

M.A., M.B., D.P.H.

INTRODUCTION BY

Colonel Sir T. Crisp English,

K.C.M.G., F.R.C.S.,

Consulting Surgeon to the British Forces.

BAILLIÈRE, TINDALL AND COX,

8, Henrietta Street, Covent Garden,

LONDON, W.C. 2.

Crown 8vo. 11 full page illustrations.
Pp. 200 + xii. 6s. net, postage 6d.

The Future of the Disabled Soldier.

By C. W. HUTT,

M.A., M.D.CANTAB., D.P.H.OXFORD.

Deputy Medical Officer of Health; recently Member of War Pensions Committee, County Borough of Brighton; Temporary Lieutenant R.A.M.C.

Crown 8vo. Price 1s. net, postage 2d.

The Discharged Consumptive Soldier.

His Treatment in Relation to the Treatment of Consumption as a Whole.

By THOMAS DENMAN.

JOHN BALE, SONS AND DANIELSSON, Ltd.,
83-91, Gt. Titchfield St., Oxford St., London, W.1.

Issued Monthly. **Subscription £1 1s. 0d. per annum, Post Free.**

The

Indian Medical Gazette.

A Record of Medicine, Surgery, Public Health and General Medical Intelligence, Indian and European, with special attention to Diseases of Tropical Countries.

THE OLDEST MEDICAL JOURNAL IN INDIA.

(Founded in 1866.)

The Gazette covers entirely different ground from the *Lancet* or *British Medical Journal* and in no way competes with them. It is an important representative medium for recording the work and experience of the medical profession in India, and by means of its exchanges is enabled to diffuse information on tropical diseases culled from an unusual variety of sources.

The contributors to the Gazette comprise the most eminent men in the profession in India, both official and non-official. Special attention is paid to the letterpress and illustration of contributed Articles.

Printed and Published by THACKER, SPINK & Co., Calcutta.
London Agents: W. THACKER & Co., 2, Creed Lane, E.C. 1.

H. K. LEWIS & Co. LTD.,

MEDICAL PUBLISHERS & BOOKSELLERS.

TELEGRAMS: "PUBLICAVIT, EUSROAD, LONDON." TELEPHONE: MUSEUM 1072.

SPECIAL STOCK OF BOOKS FOR

MILITARY AND SPECIAL SURGERY, RED CROSS WORK, AMBULANCE & NURSING.

ORDERS BY POST OR TELEPHONE PROMPTLY ATTENDED TO.

SPECIAL ATTENTION TO PACKING AND FORWARDING OF BOOKS TO THE EXPEDITIONARY FORCES IN ALL PARTS OF THE WORLD.

LEWIS'S MEDICAL AND SCIENTIFIC CIRCULATING LIBRARY.

Annual Subscription, Town or Country, from One Guinea.

The LIBRARY READING and WRITING ROOM is open daily to all Subscribers.

136 GOWER STREET and 24 GOWER PLACE, LONDON, W.C. 1.

By Appointment To H.M. The King

By Appointment to H.M. Queen Alexandra

POLISHED FLOORS.

RONUK, Ltd.

are prepared to Estimate for the Polishing and the maintenance of all kinds of floors in

HOSPITALS, INSTITUTIONS AND PRIVATE HOUSES.

WRITE FOR PAMPHLET.

Manufacturers of **"RONUK" SANITARY POLISH.**
Awarded Gold Medal at XVIIth International Congress of Medicine, and Six Medals by the Royal Sanitary Institute, including the Highest and only Awards ever granted to a Polish.

"RONUK," Ltd., Head Office and Factory, **PORTSLADE, BRIGHTON, SUSSEX.**
Depôts—LONDON: 16, South Molton Street, W. 1. MANCHESTER: 285, Deansgate.

ERGOAPIOL (Smith)

For
AMENORRHEA
DYSMENORRHEA
MENORRHAGIA
METRORRHAGIA
ETC.

ERGOAPIOL (Smith) is supplied only in packages containing twenty capsules.

DOSE: One to two capsules three or four times a day.

SAMPLES and LITERATURE SENT ON REQUEST.

MARTIN H. SMITH CO., New York, N.Y., U.S.A.
SOLE BRITISH AGENTS:
T. CHRISTY & CO., Old Swan Lane, London, E.C. 4.

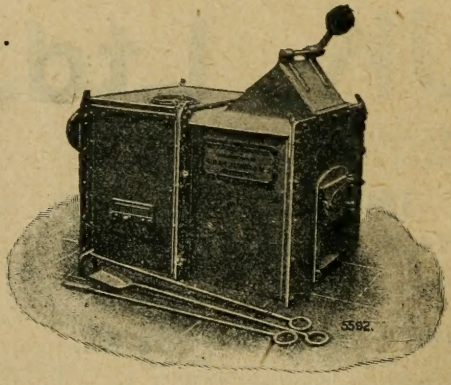
WAR!

All dressings and other dangerous refuse collected in Camps & Hospitals should be destroyed at once. The best method is to burn it in a SMALL PORTABLE

HORSFALL DESTRUCTOR.

Apply:
NEW DESTRUCTOR Co., Ltd.,
Walter House, Bedford St., Strand,
Telegrams: "Destructor Westrand London." LONDON, W.C. 2. *Telephone:* Gerrard 1840.

INCINERATORS

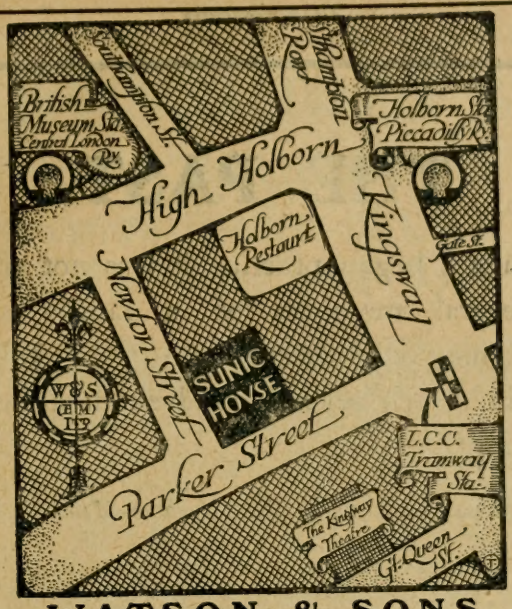


For Burning the Refuse of:—

CAMPS,
HOSPITALS,
FACTORIES.

Write for Illustrated List 900.

MANLOVE, ALLIOTT & CO., LTD.,
Engineers, NOTTINGHAM.
London Office: 41 and 42, Parliament Street, Westminster, S.W.1.



NOTE NEW ADDRESS

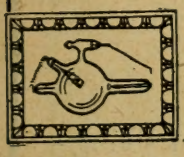
NOTE NEW ADDRESS

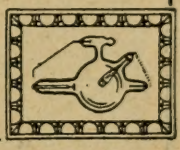
WATSON & SONS

(ELECTRO-MEDICAL) LTD.,

SUNIC HOUSE, PARKER STREET, KINGSWAY, LONDON, W.C. 2.

Telephones: Regent 1227-8. Telegrams: "Skiagram, Westcent, London."





GONORRHŒA

There is no specific so effective for the routine treatment of Gonorrhœa as **BLENOSAN CAPSULES**, which have entirely displaced the foreign-owned Gonosan Capsules.

BLENOSAN is a mixture of East Indian Santal Oil, of the finest quality, combined with a specially prepared Oleo Resin of Kava-Kava. Scrupulous care is taken with the manufacture of **BLENOSAN CAPSULES** to ensure both the accuracy of dosage and purity of ingredients, which accounts for the extraordinary success which has followed its use for the internal treatment of Gonorrhœa.

BLENOSAN

The inclusion of Kava-Kava with Santal Wood Oil is an improvement which raises this preparation above the level of ordinary Santal Oil Preparations.

BLENOSAN CAPSULES are indicated in all pathological conditions which affect the genito-urinary system, including acute Cystitis, Vaginitis, and Leucorrhœa, and where intense hyperæmia and swelling of the mucous membrane give rise to a diminution of the urinary canal.

Literature sent on Application to Medical Practitioners and Pharmaceutical Chemists.

ROBERT FERBER, Ltd.,

Manufacturing Chemists.

"HEBE" TRADE MARK

94-104, Oakley St., Lambeth, London, S.E. 1.

Canadian Office: 110, Church St., Toronto.

THE PAST.

"When I began practice it was not uncommon to see several members of a family swept off with malignant diphtheria . . . . I remember instances in which several children in a family died within a few days."

A Physician writing in the *Glasgow Medical Journal.*

THE PRESENT.

"Two people, mother and child, had been living in the same room with a child who died of diphtheria. They got sore throat, the first symptom of the dread disease, and were obviously sickening for diphtheria. *Formamint tablets were prescribed; their sore throat was cured in three days, and both escaped infection.*"

A Physician writing in the *General Practitioner.*

The Genuine Original

FORMAMINT

is manufactured solely by

GENATOSAN, LTD. (British Purchasers of the Sanatogen Company),
12 Chenies Street, London, W.C. 1. (Chairman: The Viscountess Rhondda.)

Founded 1834. **HUMPHREYS'** 25 Gold and Silver Medals.

Mobile Hospital Buildings and the New Patent Brickwork System of Construction for Munition Factories and Dock Sheds.

SAILORS' AND SOLDIERS' MOBILE PANEL HUTS AND HOSPITAL WARDS

as supplied from Stock to the

British Government Departments, The British Red Cross Society, and Order of St. John of Jerusalem, Etc., Etc., Etc.

Buildings Shipped complete from our Works, Ebury Bridge, Victoria Station (on the Thames). Standard Sizes, stocked in Sectional Panels, simple in construction, to erect abroad by ordinary labour.

FOR FULL PARTICULARS, SPECIFICATIONS AND ESTIMATES, APPLY TO—

HUMPHREYS Ltd., Knightsbridge, London, S.W. 7.

(Contractors to the Admiralty, War Office, Australian, Canadian, N.Z. and U.S.A. Governments.)

Telephone: "KENSINGTON 6447" (3 lines.)

CHILDREN'S ALLOWANCES

can be profitably employed to provide for the expenses of

EDUCATION.

Write for particulars of new Scheme of Educational Endowments to

THE GENERAL MANAGER, Clerical, Medical and General Life Assurance Society, 15, St. James's Square, S.W. 1, London; or to Messrs. HOLT & CO., 3, Whitehall Place, S.W. 1, London.

BENGER'S Food for INFANTS, INVALIDS & the AGED.

BENGER'S FOOD has gained its great reputation by the constant recommendation of medical men who know its value.

Sold in tins by Chemists, &c., everywhere.

BENGER'S FOOD, Ltd., Otter Works, MANCHESTER, Eng.

Branch Offices: NEW YORK and SYDNEY. Depots throughout CANADA.

"YADIL" ANTISEPTIC

FOR INTERNAL AND EXTERNAL MEDICATION.

OINTMENT.

Indications: — Acne, Boils, Burns, Eczema, Erysipelas, Hæmorrhoids, Impetigo, Lupus, Pruritus, Psoriasis, Scabies.

LIQUID.

CONCENTRATED FORM.

For use in all diseases arising from micro-organic infection, Colitis, Gastric Ulcers, Septic Wounds, Venereal Sores, Abscesses.

JELLY.

Indications: — Septic and Diphtheritic Throats, Tonsillitis, Quinsies, Mumps, Bronchial Affections, and Prophylaxis in infection.

Telephone: City 4373.
Telegrams: "Clemalexa, London."

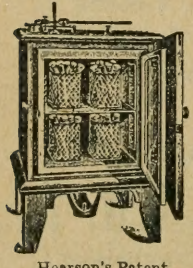
CLEMENT & JOHNSON, 19, SICILIAN AVENUE, LONDON, W.C. 1.

The word "Yadil" is registered as a Trade Mark.

HEARSON'S SPECIALITIES.

Used in all the Bacteriological Laboratories in the World, and by all Medical Officers of Health.

NEW CATALOGUE JUST ISSUED, forwarded on Application.

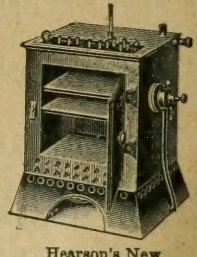


Hearson's Patent Bacteriological Incubator

Apparatus for Bacteriological, Pathological and Chemical Laboratories.

Special Apparatus for the Venereal Laboratories.

CHAS. HEARSON & CO., Ltd., 235, REGENT STREET, LONDON, W. 1.



Hearson's New Combination Incubator.

PRINTING FROM X-RAY NEGATIVES

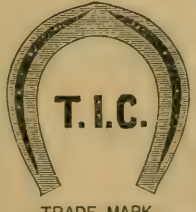
A new and valuable aid to Radiographers for this branch of X-ray work.

ILLINGWORTH'S X-RAY PAPERS

do not require any special developer. They are made in two kinds — Bromide and Gaslight — both kinds are made in two grades, one for average negatives and another for weak negatives.

SPECIALLY MADE FOR X-RAY WORK.

These Papers are the outcome of repeated experiments to produce papers specially suited to the characteristics of X-ray negatives and will be found to give the very best possible prints. They are coated with rich silver emulsions which yield prints full of gradation and with a wealth of detail.



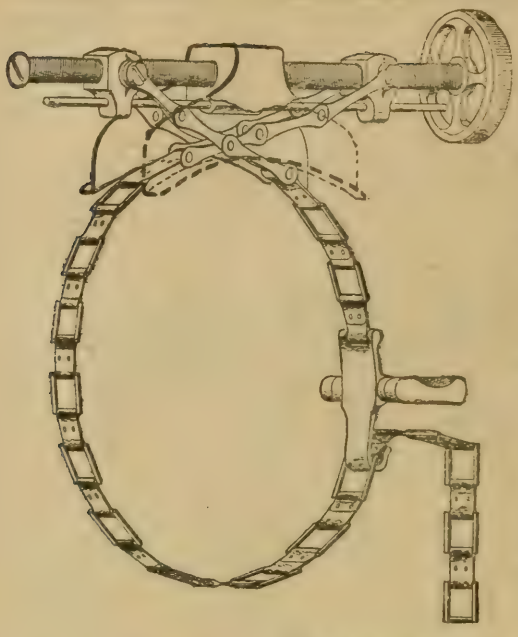
TRADE MARK.

STOCKED BY all dealers in X-ray materials, or direct from the sole manufacturers:

TRADE MARK.

T. ILLINGWORTH & CO., LIMITED,

Park Royal, Willesden Junction, London, N.W. 10.



A NEW Metal Tourniquet.

Patent Application No. 1583/17.

ADVANTAGES.

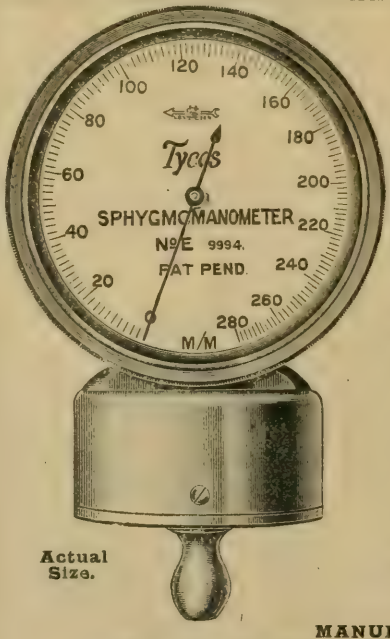
Ease of application.
Ease and simplicity of adjusting force of constriction.
Accuracy of adjustment—preventing excessive pressure and permitting early relief.
Imperishable—even in the hottest climates.
Easily sterilized.
Packs into small space.

A DEFT AND RELIABLE ASSISTANT TO THE HARD-PRESSED SURGEON.

In the course of an article in the *Journal of the Royal Naval Medical Service* for April, 1917, Temporary Surgeon-General G. LENTHAL CHEATLE, C.V.O., C.B., F.R.C.S., R.N., says: "I have confidence in recommending this Instrument. I was convinced that a properly designed and manufactured Tourniquet of metal would be superior to all instruments in use for the same work. The design fulfils all my expectations."

Write for Particulars to the Sole Makers—

JOHNSON AND PHILLIPS Ltd
CHARLTON, LONDON, S.E. 7



Actual Size.

"TYCOS" SPHYGMOMANOMETER

For determining both the DIASTOLIC and SYSTOLIC Readings of

Arterial Blood Pressure.

The simplest and most quickly adjusted instrument for determining Arterial Blood Pressure. No leather cuff, hooks or buttons. Accuracy and rapidity assured.

Sensitive but not delicate — soundly constructed, not easily deranged.

CAN BE CARRIED IN THE POCKET IN ANY POSITION, AND IS ALWAYS READY FOR USE.

Full particulars free on request. Instruments sent on approval, post free, on receipt of card. Obtainable from all reputable dealers.

MANUFACTURED BY
SHORT & MASON, Ltd.,
MACDONALD ROAD, WALTHAMSTOW, LONDON, E. 17.

'SEDOBROL'

TRADE-ROCHE-MARK

THE need for a reliable preparation which can be prescribed as a diet rather than a drug, makes itself felt especially in cases of

NEURASTHENIA, HYSTERIA, EPILEPSY, AND MENTAL DISORDERS.

Where continuous bromide treatment is necessary, the daily use of 'Sedobrol' combined with the withdrawal or limitation of salt, has proved an excellent routine treatment. (Ulrich).

A Cup of Hot 'SEDOBROL'

has the flavour of a savoury bouillon, and is made in a few moments.

'Sedobrol' Roche contains 17 grs. (1·1 gm.) of Sod. Bromide in combination with fat and spicy extractives of vegetable proteins.

'Sedobrol' Roche is PALATABLE, ASSIMILABLE, and SAFE.

DOSE: One or more tablets at bedtime or whenever necessary.

In tins of 10, 30, 60 & 100 tablets, of all Chemists.

Descriptive literature and specimen from

THE HOFFMANN-LA ROCHE CHEMICAL WORKS, LTD.,

7-8 IDOL LANE, LONDON, E.C.

With Headquarters in Basle, Switzerland,

Established in 1898.

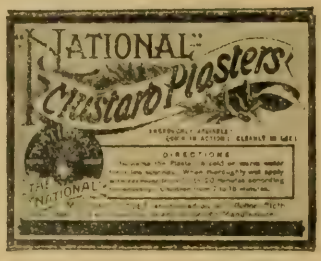
A SEDATIVE DIET

A. DE ST. DALMAS & CO.,
Leicester.

Makers of

Established 1823.

MEDICAL PLASTERS
AND SURGICAL BANDAGES.



CONTRACTORS TO HIS MAJESTY'S GOVERNMENT.

War Neuroses in Women.

If it is true that prolonged strain, fear, and worry, are conductive to psychasthenias, exhaustion neuroses, and other abnormalities, the woman at home is certainly a victim of these conditions.

Brooding in loneliness over the empty places that may never be filled again—dreading each letter, each paper lest unwelcome news is there—will disturb the equilibrium of even the best balanced nervous system, and sometimes create both neural and endocrine manifestations.

The therapy varies according to the mental and physical make-up of the patient; but Sanatogen is always helpful, not only as a nervine tonic but also as a strong stimulant of the recuperative powers of the blood—for "the brighter red the blood corpuscles, the brighter the mind."

The Genuine Original

SANATOGEN

is owned and manufactured solely by

GENATOSAN, LTD. (British Purchasers of the Sanatogen Company),
12 Chenies Street, London, W.C. 1. (Chairman: The Viscountess Rhondda.)

NOTE.—Special attention is called to the nutritive value of Sanatogen. four teaspoonfuls of which yield as much proteid nutriment as a pint of whole milk, though, of course, it is not made from whole milk, only the proteid being utilised. The shortage of supplies, due to military requirements, is only temporary, and care should be taken to obtain the genuine preparation, which will later on be re-named Genatosan to distinguish it from substitutes and counterfeits.

What Is It?

CELLOPHANE

is a soft, strong, transparent film of pure Cellulose, non-fibrous, tasteless and odourless, **absolutely** air and grease proof, unexplosive, **unaffected** by cold, heat or moisture.

An ideal packing medium for Drugs Tablets, Bandages, Surgical Instruments, &c.

CELLO-DRESSINGS as a washable, antiseptic and **sterilisable** Bandage, allow no bacteria to pass.

Prices, Samples and Particulars from

The CELLOPHANE COMPANY

(LECLERCQ & CHABÉRAT),

15 Cullum Street, E.C. 3.

GOLD MEDAL. DIPLOMA OF HONOUR. GRAND PRIX. Member of the Jury and Hors Concours at International Exhibition.

AMYCAINE

(Bi-Hydrochloride of Amyleine and Novocain.)

The New French Anæsthetic. A Substitute, seven times less Toxic than Cocain—Non-irritant—Powerfully Hæmostatic. It is antiseptic and unaffected either by heat or light, while its action is rapid and lasting.

AMYCAINE

has none of the disadvantages of Cocain or Chloroform, and no unpleasant after effects occur in its employment.

A recent Opinion of a Medical Man.

May 21st, 1918

"I have used your 'AMYCAINE' and find it very satisfactory."..:.....M.D., D.P.H.

Sample and Literature on application.

Sole Agents for Great Britain, Colonies, Dominions, U.S.A.:—

A. BREZET & CO.,

145 Wool Exchange, London, E.C. 2.

Telephone No.: CENTRAL, 3502. Telegrams: "ABREZICAL," PHONE LONDON.

ASH'S "ANTIPAIN"

The Local Anæsthetic par excellence which contains slightly less than 1 per cent. (0.97%) Cocaine Hydrochloride with other essential ingredients.

Ash's "Antipain" is a scientifically prepared Local Anæsthetic, and is being used by Dentists in all parts of the world with every satisfaction.

Supplied in 2-oz. Brown Glass Stoppered Bottles. Per bottle, 3s. 6d.

CLAUDIUS ASH, SONS & CO., LIMITED,

5-12, Broad Street, Golden Square, London, W.1.

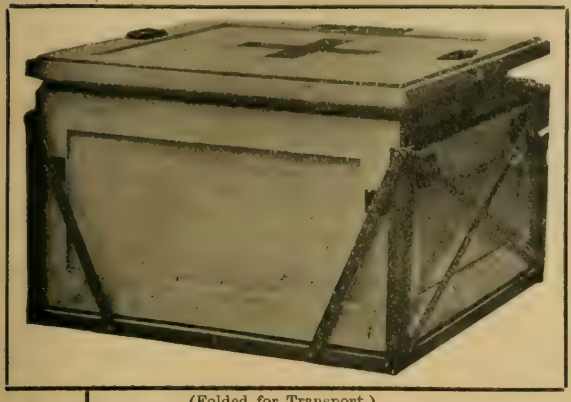
ESTABLISHED 1820.

THE

"NEWMAN" DISINFECTOR

(FLORENCE PATENT No. 4358)

UNIQUE PORTABILITY AND EFFICIENCY.



(Folded for Transport.)

Simplicity of Construction and Management.

Low Initial Cost and Economy in Use.

Hundreds already in Daily Use at the Front.

When erected for use measures 2ft. 9in. by 2ft. 9in. by 6ft. 9in. high.

When Folded for Transport, 2ft. 9in. by 2ft. 9in. by 1ft. 6in.

THE LONDON WARMING & VENTILATING Co. LTD
WEEKLY OUT-PUT OF "FLORENCE PATENT NEWMAN DISINFECTORS"
FOR BRITISH & SERBIAN RED CROSS SOCIETIES AND BELGIAN GOVT.
SHOWING-FRONT ROW PACKED FOR TRANSPORT
BACK ROW ERECTED FOR USE
SOLE MAKERS
THE LONDON WARMING & VENTILATING CO. LTD
20 NEWMAN STREET
LONDON W.

Copy of Bacteriologist's Report and Full Particulars from the Sole Manufacturers—

THE LONDON WARMING & VENTILATING CO., Ltd. (Dept. S.)

20, NEWMAN STREET, LONDON, W. 1.

"ABACOT" Registered,

MEDICO-MECHANICAL APPARATUS

For War Hospitals and Convalescence Depots.

SPECIFICATION of Active and Passive Medical Gymnastic Apparatus for Treatment of Stiffened Joints and Weakened Muscles.

1	SARGENT COMBINATION PULLEYWEIGHT MACHINE	Comprising chest weight, backboard, intercostal, chest expanding, and developing pulleys; back and loin movements, and rowing attachment with sliding seat (brings into play every muscle of body)	1 only	£15 10 0
2	SWEDISH COMBINATION APPARATUS	9 ft. 4 ft. 3 ft.	-	12 10 0
3	PEG POST	Swedish Medical	1 only	3 10 0
4	NAUTICAL WHEEL	Frictional	1 only	10 0 0
5	WALL BARS	1 set of 3 sections. Swedish Medical	1 set	6 15 0
6	MEDICAL STOOLS	1 set of 3. Swedish Medical	1 set	2 15 0
7	HIGH PLINTH	Hospital Model	-	9 10 0
8	LOW PLINTH	Hospital Model	-	8 0 0
9	MEDICAL BEAM		-	8 10 0
10	STATIONARY CYCLE EXERCISER		-	18 10 0
11	FRICTIONAL WRIST ROLL		-	3 10 0
12	FRICTIONAL WRIST MACHINE		1 pair	5 10 0
13	"ABACOT" REG. INFLATED GRIP. EXERCISER	"Zepp" shape	each	0 18 6
14	DOUBLE CYCLE RACING MACHINE	With large dial and coloured Indices	each	32 10 0
15	PUSH BALL	6 ft. 6 in. diameter	from each	63 0 0
16	COMBINED WRIST ROLL, SUPINATION AND PRONATION MACHINE	On portable stand. No fixing required	each	7 10 0
17	PUNCH DRUM AND BALL	Complete	each	6 10 0
18	MEDICINE BALLS	7 lbs. to 8 lbs. each	each	1 5 0
19	MEDICINE BALLS	9 lbs. each	each	1 7 6
20	NET BALL, GOAL POSTS AND BALL	Complete Ling Association model for use in or outdoors. No fixing required	1 set	6 10 0
21	DR. MENNELL'S ADJUSTABLE COMBINATION APPARATUS		-	30 5 0

SPENCER, HEATH & GEORGE, LTD., GOSWELL ROAD, LONDON

Telegrams: "ABACOT, BARB," LONDON.
Telephone: 12030 Central

Representative sent to advise free of charge

STOVAINE.

A reliable, non-habit-forming local anaesthetic.

Extensively used in SPINAL and DENTAL Anæsthesia.

COMPREHENSIVE LITERATURE, &c.,

obtainable on demand from the sole manufacturers,

LES ETABLISSEMENTS POULENC FRERES,

92, Rue Vieille du Temple, Paris.

SIEBE, GORMAN & Co., Ltd.

Manufacturers of

BREATHING APPARATUS FOR USE IN POISONOUS ATMOSPHERES.
APPARATUS for the THERAPEUTIC ADMINISTRATION OF OXYGEN.
Respirators. Gas Analysis Apparatus of various Patterns.

Patentees and Sole Manufacturers of

"PROTO" and "SALVUS" types of Oxygen Breathing Apparatus.
"NOVITA" OXYGEN RESUSCITATING APPARATUS.
Dr. HALDANE'S APPARATUS.

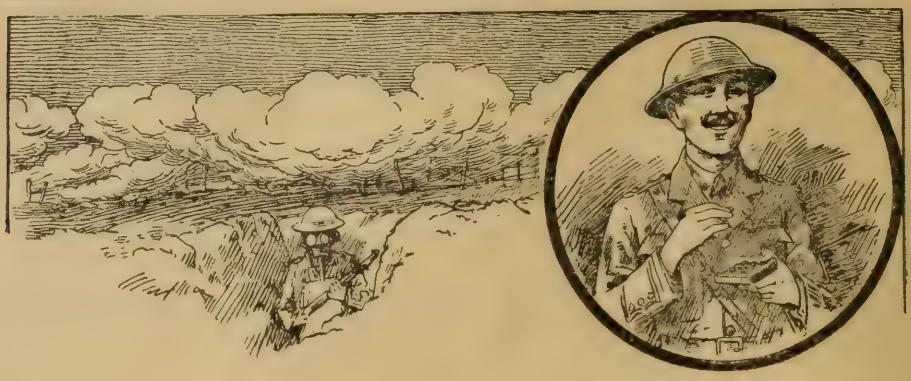
Full Particulars and Catalogues on application.

187, WESTMINSTER BRIDGE ROAD, AND "NEPTUNE" WORKS, LONDON, S.E., ENGLAND.

Telegrams—
"SIEBE, LAMB, LONDON."
Cables—
"SIEBE, LONDON."

Codes used—
A 1, A.B.C. (4th and 5th Editions),
Western Union,
Engineering and Private.

Telephone No—
HOP 3401
(Two lines).



Useful after Gas

TRADE MARK 'TABLOID' BRAND PRODUCTS

for the Respiratory Tract

Reduced facsimile

TRADE MARK 'TABLOID' BRAND Pectoral Pastilles

Demulcent, sedative, expectorant. Each product contains ammoniated liquorice, squill, tolu, senega, ipecacuanha, wild black cherry.

Tins of 16 at 1/3, *and of 36, at* 2/6, *per tin*

TRADE MARK 'TABLOID' BRAND Benzoic Acid Compound

Combines the stimulating and expectorant action of benzoic acid, menthol and ipecacuanha, with the soothing and local anæsthetic effects of codeine and cocaine.

Bottles of 25, at 1/8, *and of 100, at* 5/0 *per bottle*

TRADE MARK 'TABLOID' BRAND 'EPININE' Compound

(Trade Mark)

Presenting 'Epinine' (akin to Adrenalin), heroin hydrochloride, ipecacuanha, benzoic acid and oil of gaultheria. Soothes and stimulates the mucous membranes.

Bottles of 25, at 8d., *and of 100, at* 2/0 *per bottle*

OBTAINABLE OF ALL CHEMISTS

BURROUGHS WELLCOME & CO., LONDON

D 72

COPYRIGHT

Face first matter

VOLUME XXXI. OCTOBER, 1918. No. 4.

Journal

of the

Royal Army Medical Corps.

Original Communications.

AN ATTEMPT AT CLASSIFICATION OF *BACILLUS DYSENTERIÆ*, BASED UPON AN EXAMINATION OF THE AGGLUTINATING PROPERTIES OF FIFTY-THREE STRAINS.

BY CAPTAIN E. G. D. MURRAY.

Royal Army Medical Corps.

(*From the Vaccine Department, Royal Army Medical College.*)

CONTENTS.

(1) INTRODUCTION.

(2) PART I. SOURCES AND CHARACTER OF THE STRAINS.
- (*a*) The sources of the strains used.
- (*b*) The characters of the strains.
- (*c*) Indol formation.
- (*d*) Michaelis's acid reaction.

(3) PART II. TECHNIQUE.
- (*a*) Preparation of the bacillary suspensions.
- (*b*) Standardization of emulsions.
- (*c*) Preparation of agglutinating sera.
- (*d*) Method of performing agglutination test.
- (*e*) Time required for completion of the agglutination test.
- (*f*) Temperature at which the agglutination test is performed.
- (*g*) A method of expressing the degree of agglutination.
- (*h*) The method employed in applying the "absorption" reaction and the evidence supporting it.

(4) PART III. RESULTS.
- (*a*) Agglutination with normal serum.
- (*b*) Coagglutination.
- (*c*) Castellani's "absorption" reaction.
- (*d*) Agglutination of the mannite-fermenting strains.
- (*e*) Superimposed agglutinogenic tests.

(5) CONCLUSIONS.

(6) BIBLIOGRAPHY.

(1) Introduction.

In view of the importance of the prevention of outbreaks of dysentery in the Expeditionary Forces, Major H. Graeme Gibson published an account of a workable prophylactic dysentery vaccine in the Journal of the Royal Army Medical Corps for June, 1917.

This vaccine consists of a mixture of an emulsion of bacillary bodies and dysentery antitoxin, the latter in the form of an "absorbed" serum, injected at the same time. This has been in use in the field with good results since the date of the above-mentioned publication.[1]

In 1918, Boehncke published an account of a very similar vaccine (Dysbacta-Boehncke) which is at present being extensively used in Germany.

Shiga vaccinated 10,000 Japanese in 1900 with a mixture of dysentery bacilli and anti-dysentery serum, thereby lowering the mortality but failing to reduce the incidence of the disease. In the village of Koai, however, he succeeded in reducing the incidence from twenty-eight per month to nil.

In 1909, Dopter carried out an admirable piece of work on the various methods which might be employed in producing a prophylactic dysentery vaccine. He tried a mixture of serum and virus, but concluded that the evidence afforded by his experiments favoured the Besredka "sensitized" vaccine more than any other.

Gibson's vaccine differs from all the above in that the serum used is first "absorbed" with dysentery bacilli in order to remove the anti-bacterial antibodies before diluting it for use with the bacillary emulsion.

The work contained in this paper was undertaken in June, 1917, and had as its object an endeavour to determine the antigenic types of dysentery bacilli and thus to facilitate the selection of strains for inclusion in the British vaccine and to increase its range and efficiency. Some work commenced at Kasauli in 1916 is also included.

From the point of view of the specific treatment of cases of dysentery this work also has a bearing on the production of therapeutic sera.

The method of differentiating the various members of the dysentery group by their reactions with certain "sugars" has given rise to an increasing number of varieties proportionate to the growing number of fermentable substances employed for the purpose. The list comprises bacilli which it does not seem possible to group together systematically. The extreme variants differ in their behaviour in such essential reactions as Gram staining, motility, fermentation of lactose, the presence or absence of flagella and gas production in "sugar" media. The main characters in which the more typical members of the group differ are concerned with the fermentation of the more or less rare "sugars" and their behaviour towards specific sera.

---

[1] Gibson, Journal of the Royal Army Medical Corps, May, 1918.

Some authors have attributed the power of producing the lesions of dysentery to *Bacillus coli*, while others qualify this view by pre-supposing an exaltation of virulence of the latter. Seligmann believes that climatic or other conditions give rise to a "new generation" of infective material, occurring in the "lurking places" of specific bacteria, or in the intestinal flora of normal individuals. He does not believe that an epidemic of dysentery arises from a residuum of a previous epidemic, and he gives a graduated scale of the stages through which a coli-like organism passes until, finally, it becomes a typical "Shiga." This theory arises out of the variability observed by him in bacilli isolated from cases of dysentery as to their fermentative and agglutinative reactions.

Dopter and Vaillard quote a list of authors who ascribe to *B. coli* streptococci, diplococci, etc., a causal rôle in dysentery.

Even when the dysentery group is limited to organisms which are Gram-negative, non-motile and which do not liquefy gelatine, it does not seem possible to correlate the work of the majority of observers. This subject is ably dealt with by Cunningham and King.

Andrews, in a recent paper, says: "The great majority of the organisms which pass as 'atypical' dysentery bacilli fall under three species, which so far as present evidence goes derive their importance from their liability to be confounded with genuine dysentery bacilli." He suggests provisionally naming these "atypical" bacilli *B. ambiguus*, *B. alkalescens*[1], and *B. dispar*. The first resembles "Shiga" but produces indol and has no demonstrable relationship with human disease. The second simulates "Flexner" but ferments dulcite and produces alkali vigorously. It is not pathogenic. The third and last name is suggested to comprise lactose-fermenting organisms of the dysentery group some of which are pathogenic to rabbits. All three of these types of organism agglutinate with Michaelis' acid solutions.

Cunningham and King found that over fifty per cent of their ninety-six strains belonged to the fermentative types corresponding to "Flexner" and "Hiss-Y." Their results are summarized as follows:—

"(*a*) About thirty per cent. of dysentery strains isolated showed variations in their fermentations at some time during the course of a fermentation test of seven days' duration.

"(*b*) The amount of variation observed was considerably increased if the result of a second fermentation test, which took place after the strain had been subcultured some months, was compared with the first, only twelve per cent of strains remaining constant from the first to the last reading of both tests.

"(*c*) The majority of these variations occur soon after the isolation of

[1] Ford, W. W., *Journ. Med. Research*, vol. i, 1901, p. 211, and also "Studies from the Rockefeller Inst. Med. Research" (Reprints), vol. ii, 1904, gave the name *B. alkalescens* to a bacillus closely related to *B. enteritidis* (Gaertner).

the organism ; as the period of incubation is prolonged and as the strain grows older the fermentation becomes more constant."

The tendency of the variation was mainly towards the "Flexner" and "Hiss-Y" types. It is noteworthy that out of five strains of Type 1 (Shiga) which were subjected to a revision test some months after isolation but two remained classed as "Shigas."

Winter used chemical methods of estimating the changes in the sugar media and states that not only the "pseudo-dysentery" bacilli but true "Shiga-Kruse" also decompose maltose to a considerable extent and lactose to a less extent. As metabolic products CO_2, fatty acids (especially butyric acid) and alcohol are produced. He states that colour changes of litmus media in the determination of the decomposition process are to be used with the utmost caution.

Kuenen, quoting Levy, Kolle and Hetsch in confirmation, sharply differentiates between "Shiga-Kruse" and the mannite-fermenters. A non-mannite fermenting bacillus which ferments maltose and differs from "Shiga" in its agglutination he calls "Van der Bosch"; it shows group-agglutination with "Shiga" and "Y" sera. He considers the sub-varieties of "pseudo-dysentery" bacilli to be of little significance. The lesions caused by "Shiga" and the "pseudo-dysentery" strains are identical; the latter caused twenty-five per cent of deaths due to bacillary dysentery at Deli (Sumatra) in 1913.

Fraser does not consider that the results of fermentation tests with maltose, saccharose, sorbite and dextrin ought to be used for purposes of classification as they are very variable. He does not believe "Flexner," "Y" and "Strong" to be types.

Shiga believes the fermentation of glucose and mannite to be constant, but that of lactose, maltose, saccharose and dextrin to be variable both qualitatively and quantitatively. In his experience fermentation and agglutination tests do not correspond. He differentiates sharply between "Shiga-Kruse" and the mannite fermenters by agglutination and bacteriolysis.

In consulting the writings of numerous authors it became evident that the action of dysentery bacilli upon "sugars" is not sufficiently constant or certain to be used as the determining factor as to what strains should be included in the vaccine, or used for producing agglutinating sera.

Turning now to the subject of agglutination reactions as a means of selecting the strains, no very certain evidence of definite grouping was to be discovered.

Cunningham and King found that forty-five out of ninety-one strains reacted to the end-point of the high-titre sera used, while a further twenty-seven strains were just short of it—a partial reaction being obtained at the end-point. Thus seventy-nine per cent gave an approximately complete reaction. A further eighteen strains agglutinated to half-titre. The non-mannite fermenters agglutinated in high dilutions of "Shiga" serum.

It was shown by Vedder and Duval that there were differences in the

degree of agglutination and that in high dilutions some strains failed to agglutinate in patients' sera or in a serum supplied by Dr. Shiga.

Sternberg groups the dysentery bacilli in the following way:—

(1) Bacilli agreeing culturally with the specific types, but not agglutinated by the specific sera.

(2) Bacilli agglutinating with the specific sera but not conforming to the cultural types.

(3) Bacilli, atypical in both the above respects, but which being the dominant organism must be regarded as the presumable cause of the disease.

He further observes that anti-dysenteric serum (horse) often agglutinates *B. coli*, and that glucose, mannite and litmus whey give constant results with dysentery bacilli.

In the experience of Dopter and Vaillard, the strains of the Vincennes epidemic and those of Shiga, Kruse, Flexner and Pfuhl were not agglutinated by sera of patients in Cochin-China and fourteen other cases from the Far East, but one serum among the latter agglutinated 3 out of 11 of the above strains 1 in 20. The serum of an immunized goat agglutinated all the strains of the Vincennes epidemic.

Leisieur, Pellagot and Jacquet found that sixteen out of thirty-four strains agglutinated with Institute Pasteur specific "Shiga" serum. Some organisms are inagglutinable until some time after isolation. One strain agglutinated equally well with "Shiga" and "Flexner" specific sera, and two other strains were isolated from patients whose sera agglutinated both "Shiga" and "Flexner."

Levaditi and Nicholas state that typical dysentery bacilli produce no change in neutral red and behave typically in the sugar and agglutination reactions. Those fluorescing neutral red give anomalous "sugars" and are not agglutinated by the sera of patients from whom they are isolated nor the sera of other patients. Since the "pseudo-dysentery" bacilli often agglutinate quite well with the test sera they conclude that agglutination with specific high-titre sera is not sufficient evidence to identify them as dysentery bacilli.

Martin and Williams are of opinion that no one serum is adequate for the recognition of the mannite-fermenting group. Sera of Kruse's "A" "D" and "E" would embrace all the German strains. "Y" serum seems to be the least specific and "covers the greatest ground." Twelve out of seventy-six of the mannite-fermenting organisms isolated in Egypt in 1916 were not agglutinated by "Y" serum with a titre of 1 in 4,000; on retesting eight of these six months later, four agglutinated between 1 in 400 and 1 in 1,600. Two of the strains not agglutinating after six months subculture, and two of the others which were inagglutinable at first, were tested against the patient's sera in a dilution of 1 in 200 with positive results. These authors also remark that among mannite fermenters are comprised strains distinguishable by the "absorption" test, but which "overlap" by agglutination.

Hehewerth examined thirty strains of "non-toxic" *B. dysenteriæ* and found that his strains could not all be put into one agglutinating group. The fermentation types were inconstant and did not conform to specific agglutination. He advises polyvalent sera for the agglutination test. Castellani's "absorption" reaction in his hands did not give results allowing of a differentiation which would harmonize the results of the two tests.

Morgan found great differences between various recognized strains in their reaction to high-titre sera. He could not confirm by agglutination the grouping arrived at by means of the "sugars." With the "absorption" reaction the various strains showed approximation in some cases but wide differences in others.

Duenna and Lauber observed that strains of the "Flexner-Y" group which agglutinate readily with one serum are most refractory with other sera. They comment upon the varying agglutinability of different strains.

Lancelin and Rideau tested seventy-three strains of dysentery bacilli:—

Forty-six "Flexners" agglutinated with Institute Pasteur "Flexner" serum 1 in 4,000 to 1 in 6,000.

Twelve "Shigas" agglutinated with Institute Pasteur "Shiga" serum 1 in 3,000 to 1 in 6,000.

Four "Para-Flexner" agglutinated with an experimental "Flexner" serum 1 in 2,000 to 1 in 4,000.

Eleven "Para-dysentery" failed to agglutinate with Institute Pasteur "Shiga" serum.

"Para-Flexner" only differed from "Flexner" in that it did not ferment saccharose.

The "para-dysentery" were at first classed with the "Shigas," but were eventually separated from this group as they failed to agglutinate with "Shiga" serum. They are more toxic to rabbits than "Shiga," and likewise fail to produce indol.

None of Lancelin and Rideau's strains ferment dextrose.

Out of 138 sera of patients examined, nine agglutinated "Shiga" only, sixty-seven "Flexner" only, fifteen agglutinated "Shiga" with high group-agglutination for "Flexner." Six cases from which "Flexner" was isolated agglutinated "Shiga" and "Flexner" in high dilutions, while forty-one failed to agglutinate either type. Unfortunately, the "para-dysentery" class was not recognized until it was too late to be able to test them with the sera of the patients from whom they were isolated.

Nolf, Collard, Duliere and Roskam isolated 43 strains of dysentery bacilli of which 13 "Flexner" and 1 "Shiga" were typical. Fifteen were considered allied to "Flexner" and fourteen to "Shiga," except as regards agglutination. Ten were unlike both "Shiga" and "Flexner" in sugars and agglutination. Out of 1,944 positive sero-diagnoses 12 agglutinated exclusively with "Shiga," 991 with "Flexner" or "Y" or both, and 41 with "Shiga," "Flexner" and "Y."

Flexner quotes Gay, who found that "Shiga" and "Flexner Harris" bacilli were differentiated by bacteriolysis *in vivo* with specific sera.

Ohno considers that the action of dysentery bacilli on mannite as a means of subdividing them into groups does not correspond to the grouping obtained by agglutinating sera, and that it is incorrect to make a distinction between "acid" and "non-acid" strains. He includes lactose-fermenters in his dysentery group. It is interesting to note that in his Tables IV, V and VI, there is quite a marked distinction between the "acid" and "non-acid" sub-groups, and even in Table VII, upon which he mainly bases his conclusions, if the rabbit sera only are considered, there is quite a noticeable distinction between the two classes. There is considerable group-agglutination, but it must be borne in mind that in immunizing his animals a very small subcutaneous dose was given and complete recovery allowed to take place before giving the second and increased dose: thus the period of immunization was probably unduly prolonged. Also, he used two or three strains of the same "sugar" group to immunize his animals. He found that bactericidal reactions failed to distinguish between the "Shiga," "Flexner-Y" and other members of the dysentery group. A large number of strains were used by this observer.

Fletcher found that the mannite-fermenting strains isolated by him gave atypical agglutinations tending towards those of the "Y" type. On the other hand, only one strain absorbed the agglutinin from "Y" serum, and none absorbed the agglutinin from "Flexner" serum.

Kruse considers the "sugar" reactions of dysentery bacilli to be of doubtful specific importance. According to him "true dysentery" and "pseudo-dysentery" bacilli have an obvious phylogenetic relationship. "True dysentery" is an united and sharply-defined species, the mannite and indol tests are always negative, and they are agglutinated feebly or not at all by the "pseudo-dysentery" sera. The "pseudo-dysentery" strains are even less agglutinable by "true dysentery" sera. This relationship is also borne out by bactericidal reactions, and immunity is conferred only for the type of bacillus used. It is possible that there are races of "true dysentery" bacilli, but none have been revealed in examining many strains from all parts of the world. From an investigation of fifty strains of "pseudo-dysentery" bacilli, he concludes that agglutination is the best test. According to him the indol test is of no value. He prepared agglutinating sera from all the strains, and by agglutination and "absorption" reactions he divides them into eight races (A to H).

Type A.—The first chief race. Agglutinated by almost every type of serum very highly. Serum A agglutinates B just as well as A, and frequently agglutinates C, D and E very highly and the rest of the types not at all. A "absorbs" B agglutinins and partly "absorbs" C agglutinins." It is the most commonly-occurring German strain. Lactose, maltose and sacchorose are not fermented.

Type B.—(Three strains) does not "absorb" A agglutinins. A and B are

indistinguishable by bactericidal reactions. They differ from A culturally by fermenting maltose, but all the B strains examined differed from one another culturally. They came from Flexner. ("Flexner Harris," "Flexner Manilla," "Flexner America.")

Type C.—(Two strains) serologically identical and not able to "absorb" any other sera. One fermented maltose and the other failed to do so.

Type D.—Second chief race (fifteen strains). More or less strongly agglutinated by sera A, B and C, and weakly by the other sera. Serum D agglutinates A and B highly and the others slightly. Reciprocal absorption with the other types is negative.

Although A and D affect each other strongly in bactericidal reactions, immunity only exists for the homologous strain. Two of this type fermented maltose. He thinks that "Hiss-Y" may belong to this type.

Type E.—When freshly isolated, is strongly agglutinated by A, B and C sera, and conversely E serum affects A, B and C, though more irregularly. Reciprocal absorption does not occur. Active immunity for A, D or E is only conferred for the respective type. Type E was isolated from four sporadic cases in three different Rhine country towns. Lactose and maltose are acidified and milk is clotted in eight to fourteen days.

Types F, G and H comprise three strains which not only do not fall into any of the above types but which differ also among themselves. ("Strong" Manilla and two strains from Von Deycke at Constantinople). Two are strongly agglutinated by sera A and E. One ("Strong") did not agglutinate at all with these sera but shows its relationship to the "pseudo-dysenteries" by the fact that its serum agglutinates the other types, especially A and B. Lactose, maltose and saccharose are variously affected.

The types A and D have been found so often and with the same permanent properties that there is no doubt as to their constancy and pathogenicity. They agglutinate with the patient's sera and a laboratory infection has recently been observed with one of them. The other bacilli, especially those found only once, must therefore be regarded as excitors of the disease by analogy only, and in their case further observation is necessary.

Hutt discusses the results of examining over a hundred strains of "pseudo-dysentery" bacilli and considers it justifiable to consider them as one group. He divides them into eight sub-orders or races by agglutination and absorption tests (A-H).[1] Races B, C and F were only found associated with other races and therefore he calls them secondary. Race E (=Kruse E) is the only one which forms acid, though slowly, in lactose, and therefore it clots milk in from fourteen to twenty-six days. The E are the only strains which agglutinate with E sera, and Hutt considers this race to be a primary cause of dysentery. He includes strains from the Berlin epidemic, and also six strains isolated and described by Berthlein.

---

[1] This is Kruse's classification.

Berthlein investigated an epidemic of sixty cases, at first severe but later of milder type (chiefly diarrhœa). From four of the early cases he isolated a dysentery-like bacillus of the mannite-fermenting group, not forming indol. Serologically, the strains of this bacillus differed from all other types of dysentery bacilli, but agglutination showed them to belong to one type. Small doses of living culture killed rabbits, guinea-pigs, mice, etc., as also did killed cultures. Two similar strains were isolated from later cases. He lays some stress on difference of shape of colonies to be seen when the strains are plated out. (These strains were among those examined by Hutt, who classes them with Kruse's Group E.)

Dorendorf and Kolle recognize "Shiga" as a cause of dysentery, but thinks the mannite-fermenting bacilli are symbiotic or even merely saprophytic, living on the mucous membrane which has been altered by some cause of dysentery still unknown.

Dopter showed that the Bordet-Gengou reaction fails to distinguish between the various types of *B. dysenteriæ*, both in the case of serum from immunized animals and from patients. When, however, such serum is tested by agglutination it may show well-marked selective properties. Some strains of *B. coli* will also fix the complement to a less degree, but the control, though never positive with *B. dysenteriæ*, is sometimes so with *B. coli*.

Schmitz investigated an epidemic of dysentery among Roumanian prisoners of war. It was typically a contact epidemic occurring during the months of January and February (1916).

The unfavourable conditions of food, the extremely unsanitary condition of the prisoners, insufficient heating arrangements or other protection from climatic conditions during a very severe winter enabled the epidemic to spread at this unusual time of year. There were 815 cases, of which 104 showed typical dysenteric stools, while the rest had more or less severe diarrhœa with or without traces of blood and mucus. The duration of the attack was ten to fourteen days, and it required six weeks before recovery was complete. Of 104 cases, 5 died of dysentery, and 58 others out of the original 815 cases died of pneumonia. From the earliest part and throughout the epidemic, bacilli of the dysentery group were recovered from the stools of the patients. It was only possible to investigate 79 patients, but they were examined very thoroughly. As many colonies as possible were picked off from each plate. Bacilli which could be pronounced dysentery bacilli were found in 22 patients, and these were only to be found in the typical blood and mucus stools. Stools which were merely watery were negative. Twelve plates gave 138 colonies, of which 61 proved to be dysentery bacilli, and out of 38 sub-cultures from 9 plates 22 were dysentery bacilli (57·89 per cent). Out of another 39 cases the bacillus was found in 19; the stools of the rest were fæcal. The type of bacillus differed from the recognized members of the dysentery group in the following ways:—

(*a*) *Culturally:* (1) From the group of "pseudo-dysentery" bacilli by not decomposing mannite.

(2) From "Shiga-Kruse" by abundant indol formation.

(*b*) *Serologically:* (1) No pseudo-dysentery serum agglutinated the "Schmitz" type; nor did the serum produced by the "Schmitz" strains agglutinate any single "pseudo-dysentery" strain. Absorption tests bore out this difference.

(2) The same difference existed between the "Schmitz" strains and "Shiga-Kruse" as between the "Schmitz" strains and "pseudo-dysentery" strains.

(3) The "Schmitz" strains agglutinated in high dilutions and absorbed the agglutinins from any "Schmitz" strains serum.

In one case only (6877) was any other type of dysentery bacillus found; this proved to be a "Y."

"The bacillus of this epidemic, which is to be called 'Schmitz,' thus takes a midway position between the hitherto known groups of dysentery bacilli. It belongs to a new group of which there may perhaps be other representatives."

That this organism is to be regarded as the causal agent of the epidemic is evidenced by the fact that it was only found in the sanguino-purulent portions of the fæces, where it alone occurred, and further that the sera of a series of patients agglutinated this bacillus in high dilutions.

That it belongs to the dysentery group is proved by the character of the epidemic; the coagglutination in Widal tests with "Shiga-Kruse," though in low dilutions; its non-motility and freedom from flagella; the typical dysentery odour of the culture and the characteristic dysenteric lesions as found in autopsies. It does not produce any change in neutral red agar.

In his second paper Schmitz concludes, on the evidence of agglutination and absorption reactions, that the pseudo-dysenterics are all recognizable by their close serological association, though the relationship of the individual strains to one another is very variable.

The following conclusions can be drawn from the literature cited:—

(1) That the evidence of complement fixation tests, and probably the bactericidal reaction, is such as to warrant the "acid" and "non-acid" dysentery bacilli being considered as belonging to the same genus.

(2) That *B. dysenteriæ* "Shiga" forms a well-defined species within this genus with the possibility that the "para-dysentery" group of Lancelin and Rideau form a closely-related variety.

(3) That the *B. dysenteriæ* "Schmitz"[1] forms another distinct species of

[1] A recent paper by Lampl (Wien. Klin. Woch, July 25th, 1918) confirms Schmitz's work in a small but striking way.

the true dysentery genus, distinguishable from "Shiga" by agglutination and "absorption" reactions and by the fact that it produces indol. That this bacillus is probaby identical with Andrew's *B ambiguus* seems evident, and therefore Michaelis's acid agglutination is of no value in distinguishing pathogenic from non-pathogenic dysentery bacilli.

(4) That the mannite fermenters are quite distinct from the non-mannite fermenting group. That they vary very considerably among themselves in their antigenic properties, though probably the differences are not wide enough to classify them as different species.

(5) That the splitting up of the acid group of bacilli by their action on "sugars," besides being in itself unsatisfactory, is no guide to their immunological differences.

(6) That as many authors have described lactose-fermenting members of the dysentery group in connexion with cases of dysentery, the strains included in Kruse's Group "E" deserve further attention in order to define their prevalence and pathogenicity.

(Kruse, Hutt, or Berthlein do not doubt the importance of this group as a cause of dysentery.)

PART I.

Sources and General Character of Strains.

(a) *Sources of Strains.*

I am indebted to:—

Colonel Ledingham, for "Shiga Ledingham," "Flexner Ledingham" and "Y Ledingham" which he gave to me as typical examples of their class, presumably from Egypt, when he came out to Mesopotamia in September, 1916.

Colonel Dudgeon, for "Logan," 6066, 6067, 1210, 6091, 1609, 1460 and Gallipoli, brought by him from Salonica and Gallipoli. He notes that strain 6091 was not agglutinable to the same degree as the others.

Major F. W. Andrews, F.R.S., for five strains:—

Oxford "Y"[1] (from the Pasteur Institute, Paris). (Possibly the true type "Y".)

Oxford "Flexner." (The true type Flexner.)

Whittington.

Mountain. (No. 2464.)

Hughes.

Major J. Cunningham, I.M.S., of the Central Research Institute of

[1] Major F. W. Andrews, F.R.S., tells me that the Oxford "Y" proves quite different from the historical Hiss and Russel "Y" obtained by him from Washington.

India (Kasauli), who kindly obtained the following strains from Dr. Kesava Pai, at Madras :—

"Flexner Pai"
Mahamid Ali
Karim Khan
Rama Cooly
Sada Gopall
Chuna Famlia
} 136A Dys. M +

Professor Dean, for sending me his strains "Dean" I and "Dean" II.

Captain Perry, R.A.M.C., who sent me three strains from France: PB 23, PB 24 and PB 27.

Captain Broughton Alcock, for two strains which he brought from Malta, DJ and Blood. The latter was isolated by blood-culture from a case of Shiga's dysentery.

The strains "Shiga" Lister, "Flexner" Lister,[1] and "Y" Lister came from the Lister Institute.

The following strains were among the "stock" cultures at the Royal Army Medical College, and their origin is either from France or Flanders: Hagen, Haines, 6, 7, 13, Maltos, Humphries, Marginson, Ogg, Constance, Toner, Sincos and Fletcher.

The strain Wainwright was sent from Egypt.

Strains Whitby and Harrison are of unknown origin.

When in Mesopotamia I isolated the strains 19A, 34A, 67B, 86A and 104C from acute cases of dysentery. Unfortunately, my notes and some other strains were lost when I was invalided back to India with dysentery in October, 1916. Strain 104 originates from myself.

(b) *Characters of the Strains.*

The fifty-three strains examined fall into four classes, as shown in the following table :—

TABLE I.

	Glucose	Lactose	Mannite	Dulcite	Motility*	Litmus milk
Class 1 ..	A	0	0	0	0	A→K
Class 2 ..	A	0	0	0	0	A→K
Class 3 ..	A	0	A	0	0	A→K
Class 4 ..	A	Irregular; late A	A	0	0	A—→K—→A Sometimes late clot

A = Acid only
0 = No change
K = Alkaline
} After fourteen days' incubation at 37° C.

* In hanging drop from four to six hours' broth culture.

[1] In Glyn's paper this strain is called "Millbank Flexner."

Classes 1 and 2 are separated for purposes of description later as to indol production, acid agglutination, specific agglutination and "absorption" reactions.

The existence of Class 4 is explained by the fact that :—

(A) "Flexner" "Ledingham" was given to me by Colonel Ledingham as being a typical "Flexner" strain.

(B) "Y"-Lister is the Lister Institute typical "Y" strain.

(C) All the strains in this class have at one time been included in Class 3 because at first they failed to ferment lactose in fourteen days, but it was noticed later that they possess the property of acting on this sugar. This property varies in the different strains and in the same strain at different times; two days is the shortest time in which the change has been observed to take place, and quite often there has been no change until well into the second week of incubation. From time to time one or other of the Class 4 strains fails to ferment lactose even in twenty-one days, though there has been profuse growth. Sometimes the change is very gradual. A second acidity in milk is sometimes produced, often resulting in the clotting of the milk after prolonged incubation. (Many strains of Class 3 have been observed to produce a second acidity in milk but not so readily as Class 4.) None of these strains have ever been grown and sub-cultured from a lactose medium except presumably on primary isolation in common with all the other strains. (They have been under observation for periods varying from one to two years.)

(D) Class 4 is probably identical with Kruse E.

The distribution of the various strains in the four classes is shown in the Table II.

TABLE II.

Class 1 ..	"Shiga Ledingham," "104c," "Blood," "Shiga Lister," "Hagen," "Wainwright," "S 7," "Dean 1," "Dean 2."
Class 2 ..	"Haines," "6," "13," "Whitby," "Fletcher," "Harrison."
Class 3 ..	"Y Ledingham," "34A," "Flexner Lister," "Maltos," "Humphries," "Marginson," "Ogg," "Constance," "Toner," "Sincos," "DJ," "PB23," "PB24," "PB27," "Logan," "1609," "6066," "6067," "1210," "6091," "1460," "Gallipoli," "Oxford Y," "Oxford Flexner," "Whittington," "Mountain," "Hughes," "Flexner Pai," "Mahamid Ali," "Karim Kahn," "Sada Gopall," "Chuna Famlia," "Rama Cooly."
Class 4 ..	"Flexner Ledingham," "Y Lister," "19A," "67B," "86A."

(c) *Indol Formation.*

The paradimethylamidobenzaldehyde of Ehrlich being unavailable, the nitroso-indol reaction was employed.

The technique adopted was as described by Gordon in his translation of Abel's "Laboratory Handbook of Bacteriology." Five cubic centimetres of a one per cent solution of peptone (Witte) was inoculated from a single

colony of the strain to be tested and incubated at 37° C. for seven days. One cubic centimetre of a twenty-five per cent solution of sulphuric acid in distilled water was then added, after which one cubic centimetre of a freshly prepared solution of sodium nitrite in distilled water was floated on the top.

A red ring at the junction of the fluids within five minutes indicates the formation of indol. (Note.—The tests were read again after standing for five hours, and there was no change in the results.)

The formation of indol in the mannite fermenters varied with the strain and bore no relationship to the serological types. The reaction will not be further considered in connexion with them except to note that, in the few strains so tested, no relationship was observed between the fermentation of dextrin and the formation of indol as noted by Cunningham and King in the majority of their strains.

The special interest of the reaction is in relation to the non-mannite fermenters. In this group there is a definite relationship between the indol test and the absorption of agglutinins from specific serum.

All the strains of Class 1 were negative as regards indol, whereas all those of Class 2 were positive.

(d) *Michaelis's Acid Agglutination.*

Michaelis states that dysentery bacilli are not agglutinated by the acid solutions described by him, even in the presence of albumin in the form of a trace of normal serum. *B. typhosus* and *B. paratyphosus* A and B and rarely aberrant forms of coli are agglutinated even in the absence of albumin. *B. dysenteriæ* is differentiated from *B. coli* in that the latter agglutinates in the acid solutions in the presence of albumin.

Michaelis's solutions are made as follows :—

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Normal NaHO	5 c.c.	5 c.c.	5 c.c.	5 c.c.	5 c.c.	5 c.c.
Normal acetic acid ..	7 ,,	10 ,,	15 ,,	25 ,,	45 ,,	85 ,,

Sufficient distilled water is added to each to bring it up to 100 c.c.

Technique of the Reaction.—An abundant twenty-four hour agar culture is suspended in twenty cubic centimetres of distilled water ; in each of six tubes is placed three parts of this suspension with one part of the above solution of acid, the latter being added to its respective tube together with a trace of normal serum. (One drop of a 1 in 10 dilution of normal rabbit serum was used in these experiments.) The contents of the tubes are then well mixed and left undisturbed at 37° C. for two hours, after which time they are read off. Only agglutination visible to the naked eye is considered positive.

All the strains of Class 2 are positive to the test. Of Class 4, Flexner, Ledingham and 86A were also positive. The optimum in each positive reaction occurred in tube 6, and most of them agglutinated to a less degree in tube 5.

The following strains, observed after two hours, showed agglutination visible only by the aid of a lens, but on keeping them for about five hours at laboratory temperature showed flocculation clearly visible to the naked eye :—

Class 4 strains, 19A and 67B.

Class 3 strains, Oxford Y and Hughes.

Class 1 strains, Shiga "Ledingham," Shiga Lister and Shiga 7.

The typhoid strain "Eyre" (which is used for agglutination at the Royal Army Medical College) showed no agglutination visible to the naked eye, though there was lens-visible agglutination in tubes 5 and 6.

One strain which, as it ferments dulcite, is not included in the list of strains used in this work, was also negative to Michaelis's reaction.

With regard to the validity of the test, Andrews came to the conclusion that though the test is an empirical one it seems likely to be of much service, though failure to agglutinate does not prove an organism to be true dysentery. He also noticed granulation visible with a lens in "one or two" true "Shigas." One Flexner Y, even after plating out the strain and selecting two single colonies, showed feeble agglutination visible to the naked eye.

Patrick applied Michaelis's test to forty-five strains of typhoid, and, though he does not doubt the constancy of the results with a given strain, he found the optimum as described by Michaelis to be given by twenty-three strains only. Eight strains failed to agglutinate. Nine gave paratyphoid reactions. The maximum was independent of the time of isolation of the strain. He concluded from his results that the test is of interest rather than of value in the examination of typhoid.

Rost (quoted by Patrick) concluded from an examination of eight strains that the method is a valuable addition to our resources for diagnosing typhoid.

Jaffe (also quoted by Patrick) tested 41 strains of *B. coli*, 40 strains of *B. typhosus*, 11 of *paratyphosus* A, 3 of *paratyphosus* B and 3 of *B. typhi murium* with unsatisfactory results.

(*To be continued.*)

THE PROPHYLAXIS OF MALARIA.

By Colonel G. T. RAWNSLEY, C.B., C.M.G.
Lieutenant-Colonel R. A. CUNNINGHAM.
Royal Army Medical Corps.
AND
Captain J. WARNOCK.
Royal Army Medical Corps.

(Concluded from p. 75.)

(A) Outline and Result of Treatment.

The results of the preliminary observations on the intensive treatment of malaria by large doses of quinine were published in the Journal of the Royal Army Medical Corps for the month of July. The improvement in the state of health of the men who underwent this course justified the decision to place the whole of the — — Corps during the winter months of 1917-18 on antimalarial treatment, employing a similar dosage, but the duration thereof was reduced from twenty-eight to twenty-four days; this was spread over practically the whole winter months, as the bulk of the troops were treated during the periods when they were out of the line in reserve areas; fifteen grains of quinine sulphate were given morning and evening in combination with arsenic, a typical prescription being :—

℞	Quin. sulph.	15 gr.
	Acid. sulph. pur.	1¼ min.
	Spts. chloroform	1⅓ ,,
	Spts. vini rect.	1½ ,,
	Liq. arsenici hydrochlor.	2 ,,
	Sacch. ust.	11 ,,
	Ol. menth. pip.	1/30 ,,
	Aquæ	ad 1 oz. p.

In some cases arsenic was omitted from the mixture and given in the form of iron and arsenic tabloids; one, morning and evening. The composition of the tabloid was :—

℞	Ferri hypophos.	2 gr.
	Quin. bisulph.	1 ,,
	Acid. arsenious	1/60 ,,
	Strychnin sulph.	1/60 ,,
	Saccharin	1/100 ,,

For many reasons it was thought advisable to try and disguise the taste of quinine (so that the men should not know they were taking this drug), and the mixture was always alluded to as "the antimalarial tonic."

The course was voluntary, the total numbers treated were 38,433, of whom 23,071, or sixty per cent, were known to have had malaria, but

the numbers infected were undoubtedly higher; about fourteen per cent of the then strength did not undergo treatment.

Relapses occurred in the following proportions:—

	Numbers	Percentage of infected	Percentage of strength
(*a*) During period of treatment	424	1·83	1·10
(*b*) During first month after treatment ..	1,695	7·34	4·41
(*c*) During second month after treatment ..	2,750	11·91	7·15
Totals ..	4,869	21·08	12·66

It was noticed that men who got all their nights in bed suffered very little from relapse (mosquitoes were absent at this time); another class who were singularly free from both primary and recurrent malarial attacks were the older men, illustrative of this statement being a brigade of another corps consisting of old soldiers who have suffered very little from malaria during the whole period of its stay in Macedonia.

From a perusal of these facts it is apparent that complete sterilization of the blood, even by such a course of intensive treatment with quinine, cannot be claimed to be a complete success; efficient measures were taken to ensure that the treatment was thorough and dosage not missed, but apart from this the troops were only too keen and anxious to be cured, and it is certain faulty administration played no part in the results. Quinine therefore must be considered to have no permanent power of sterilization, as it is not thought larger doses could be given with safety, at any rate to troops in the field; the drug undoubtedly kills off large numbers of the young ring forms, and either in this way or by its tonic action or both combined raises the hæmoglobin index of the blood when given in intensive doses.

It may be of interest to record the fact that in forty recent post-mortem examinations made by Captain Warnock, R.A.M.C., malarial pigment was found in both spleen and marrow bone, sections of which were laboriously examined microscopically, both by this officer and other bacteriologists, with the result that only a single parasite (a crescent) was found in the spleen of one case, also that in blood films taken from many men who had suffered from malaria but not of very recent date, it was rare to find the parasite.

The general opinion of medical officers regarding this course of intensive treatment is that although complete sterilization has not been obtained yet the tonic effects thereof have been most beneficial, that the general state of health has been vastly improved and many men kept in the field who would otherwise have been admitted to hospital or found unfit for duty for varying periods; it has also been observed that relapses are far less severe, the duration, in a very large proportion of cases, of each attack only a day, and readily yielding to further quinine and antipyretic treatment.

(B) Statistics of Sickness and Malaria.

For various reasons the whole strength of the corps could not be placed under treatment, so the statistics of sickness as a whole are not

based on the strength who underwent treatment, nor are the admissions for malaria in this table. The average daily sick rates from December to May are :—

1917.		1918.	
December (1916)	0·18 per cent.	December (1917)	0·18 per cent.
January	0·16 ,,	January	0·16 ,,
February	0·20 ,,	February	0·22 ,,
March	0·25 ,,	March	0·26 ,,
April	0·19 ,,	April	0·25 ,,
May	0·24 ,,	May	0·25 ,,

In 1916 and 1917 sick were largely evacuated to Malta and so there were fewer admissions for relapses ; in 1917-18 sick were kept at Salonica, and the percentage of men infected by the malarial parasite was far higher. The incidence of malaria was :—

Period November 4, 1916, *to June* 2, 1917.		*Period November* 3, 1917, *to June* 1, 1918.	
1916.		1917.	
Week ending November 4	320	Week ending November 3	992
,, ,, ,, 11	250	,, ,, ,, 10	683
,, ,, ,, 18	166	,, ,, ,, 17	510
,, ,, ,, 25	164	,, ,, ,, 24	411
,, ,, December 2	134	,, ,, December 1	505
,, ,, ,, 9	92	,, ,, ,, 8	294
,, ,, ,, 16	103	,, ,, ,, 15	211
,, ,, ,, 23	81	,, ,, ,, 22	244
,, ,, ,, 30	68	,, ,, ,, 29	120
1917.		1918.	
,, ,, January 6	48	,, ,, January 5	125
,, ,, ,, 13	53	,, ,, ,, 12	124
,, ,, ,, 20	83	,, ,, ,, 19	102
,, ,, ,, 27	83	,, ,, ,, 26	102
,, ,, February 3	105	,, ,, February 2	79
,, ,, ,, 10	84	,, ,, ,, 9	97
,, ,, ,, 17	73	,, ,, ,, 16	231
,, ,, ,, 24	122	,, ,, ,, 23	283
,, ,, March 3	115	,, ,, March 2	371
,, ,, ,, 10	123	,, ,, ,, 9	310
,, ,, ,, 17	143	,, ,, ,, 16	385
,, ,, ,, 24	205	,, ,, ,, 23	394
,, ,, ,, 31	205	,, ,, ,, 30	470
,, ,, April 7	188	,, ,, April 6	568
,, ,, ,, 14	168	,, ,, ,, 13	375
,, ,, ,, 21	244	,, ,, ,, 20	297
,, ,, ,, 28	236	,, ,, ,, 27	276
,, ,, May 5	303	,, ,, May 4	326
,, ,, ,, 12	248	,, ,, ,, 11	346
,, ,, ,, 19	338	,, ,, ,, 18	403
,, ,, ,, 26	280	,, ,, ,, 25	353
,, ,, June 2	233	,, ,, June 1	359
Total ..	5,058	Total ..	10.346

(c) The Effect of Hot and Cold Weather on Malaria.

From a study of these admission rates it will be seen there is a decline in the admission rate for malaria in the winter months ; this relation of heat and cold appears constant, and to have an important bearing on the incidence of relapses amongst men infected by the malarial parasite.

Surely we ought to expect more relapses in December, January and February than in March, April and May, the original infections being of more recent occurrence; fresh sources of primary infection being absent. This year at least sixty per cent of — — — Corps were known to be affected, and yet relapses in December, January, and up to the middle of February are low, but from then onwards with the increase of the temperature of the air the admission rate becomes higher. In the month of January, both in 1917 and 1918, anopheline larvæ were found but no pupæ; this year very few anopheline larvæ were found in the *traps*, and none earlier than the middle of May. Last year it was considered primary infections began about June 12. which the observations as regards larvæ will undoubtedly confirm for this year; the only mosquitoes in the earlier months are hibernating and inactive. These facts therefore prove that the cases which occur at this period of the year are due to relapse. There is therefore a period of natural decline of recurrent malaria corresponding to the cold weather, and which is quite independent of quinine administration, as in the winter of 1916-17 in the absence of such treatment the same fall in the admission rate occurred.

On two or three occasions this winter there have been spells of hot weather followed by blizzards, with a corresponding rise and fall in the admission rate for recurrent malarial fever.

With the increase of temperature in the summer months we find cases of malignant malaria occurring (which are rare in the winter), until towards the end of the malarial season this type is very frequent, the maximum intensity being reached towards the end, about October to November; from then onwards it gradually declines until from March to June such cases are seldom seen. Such was the experience in 1916, 1917 and 1918. The question has arisen whether the *A. superpictus* carries the subtertian parasite entirely or better than the *A. maculipennis*, as it is more prevalent during late August and September when subtertian malaria is most in evidence.

During this winter the corps sanitary section caught 62,000 hibernating anopheline mosquitoes, few males were found and these only at the beginning of the winter; mosquitoes examined were not found to carry the parasite.

(D) Conclusions.

As a result of this intensive course of quinine to nearly 39,000 men the opinion has been formed that complete sterilization of the blood cannot be obtained, that the drug is able to kill off young ring forms, but has no effect on gamete forms; that it has a powerful action by this method of administration of rapidly raising the hæmoglobin of the blood. It is also safe to administer such a course of quinine under ordinary conditions.

The chief measures therefore on which we must rely for the eradica-

tion of malaria are those directed to: (*a*) the primary destruction of the mosquito throughout all stages of its development, conducting a very vigorous warfare by means of drainage and canalization, oiling or cresolizing of pools, laying down traps and destruction of brushwood and undergrowth, which measures, to be thorough, should be maintained throughout the whole year in malarial countries; (*b*) the protection of man from the bites of mosquitoes by means of mosquito-proof buildings, nets, gloves, veils and the use of deterrent ointment; (*c*) destruction of hibernating mosquitoes; (*d*) the cure of the infected to be attempted in the winter months, or (*e*) their removal to cold climates where anopheline mosquitoes are non-existent; (*f*) the maintenance of a high standard of general sanitation.

Finally, *prophylactic* quinine is a waste of time and money, and a measure which, on account of its futility, is exceedingly unpopular with those who have to take it. *Curative* quinine is at present our most powerful drug, but is uncertain in its action and disappointing in its results, and we should search for some other remedy for the destruction of the malarial parasite and the cure of malarial fevers.

DYSENTERY—A CLINICAL STUDY.

By Lieutenant-Colonel JOHN M. COWAN.
Royal Army Medical Corps.
Consulting Physician, E.E.F.
AND
Captain HUGH MILLER.
Royal Army Medical Corps.

(*Continued from p.* 228.)

The character of the stools in dysentery varies in more or less regular fashion from day to day. In an acute case the stools are at first wholly composed of blood and mucus in varying proportion, the former being sometimes the chief element, sometimes merely a streak or two in a mass of glairy mucus. At first fresh and "bloody" in appearance, it soon changes its character, the red cells disintegrating and staining the mucus a rusty colour. Pus soon makes its appearance in varying amount, the blood disappears altogether, the mucus becomes opaque and more thick, and finally less and less in amount, until it finally disappears.

As soon as the bowel is emptied of its original fæcal contents the stools are wholly composed of catarrhal products. The first sign of improvement is the addition of fæcal matter, at first abnormal; perhaps offensive in odour, at any rate abnormal in colour, consistence, and composition, little specks or masses of blood, undigested food, exudate, and fæces being mingled together. In cases which are progressing satisfactorily the administration of bismuth causes blackening of the stool, but in cases which are not progressing satisfactorily no blackening ensues. The point is of value with regard both to prognosis and to treatment. As further progress ensues, the stools become homogeneous and more or less normal in colour and consistence, though they may be loose, semi-formed or formed; while the blood mucus and pus may still obtain, but are now discrete and apart from the fæcal material. In time they disappear.

We are accustomed to talk of (1) dysenteric stools (blood and mucus), (2) abnormal stools, and (3) normal stools.

Captain Mackie also recognizes three stages in the stools of acute dysentery from the bacteriological standpoint. In the first dysentery bacilli are present; in the second they have disappeared, but the flora is abnormal, *B. Morgan*, *B. fæcalis alkaligenes*, *B. C.L.A.* 1, *B. C.L.A.* 2, streptococci, etc., being present. In the third *B. coli* is predominant (Cf. protocols, p. 278.)

In many cases of clinical dysentery no dysentery bacilli are present, but the bacteria of Captain Mackie's second stage (concomitants) are

CASES OF DYSENTERY SHOWING THE NUMBER AND CHARACTER OF THE STOOLS FROM DAY TO DAY AND THE BACTERIOLOGICAL REPORT.

Serum 80 c.c.

Days of disease.	Number of stools per diem	Character of stools	Bacteriological report on stools
On admission			
5	Frequent	Bloody muco-pus	—
6	do.	—	*B. dysenteriæ* (mannite-fermenter atypical)
7	do.	Very bloody	—
8	do.	More fæcal, less bloody ..	*B. dysenteriæ* (Shiga)
9	do.	Bloody mucus	,, ,,
10	9	Pink muco-pus	—
11	10	Fæcal, bloody muco-pus ..	*B. dysenteriæ* (mannite-fermenter atypical)
12	10	Fæcal, bloody pus	—
13	5	Fæcal, some exudate	—
14	6	—	—
15	6	Semi-solid, some exudate ..	*B. dysenteriæ* (Shiga) *B. C.L.A. 2*
16	3	Semi-solid, slimy	*B. paracolon*
17	3	Formed	*B. C.L.A.* 2
18	2	Formed, some exudate ..	—
19	2	Fæcal	*B. C.L.A.* 2
20	2	Formed, a little exudate ..	*B. dysenteriæ* (mannite-fermenter atypical)
21	1	Fæcal, a little exudate ..	—
22	1	Normal	*B. paracolon*
		No serum.	
On admission			
6	—	Bloody mucus	—
7	9	Very offensive, bloody mucus	*B. dysenteriæ* (mannite-fermenter)
8	8	—	—
9	6	—	—
10	4	Fæcal, slimy, some fresh blood	—
11	4	—	—
12	4	—	—
13	3	Fæcal, some pus	—
14	3	Fæcal, some mucus	—
15	4	—	—
16	4	Formed, some mucus.. ..	*B. dysenteriæ* Y, *B. fæcalis alkaligenes*
17	4	,, ,, ,, ...	*B. dysenteriæ* Y, *B. fæcalis alkaligenes*
18	5	,, ,, ,, ...	*B. dysenteriæ* Y, *B. fæcalis alkaligenes*
19	5	A very little mucus, normal..	*B. fæcalis alkaligenes*
		No serum.	
On admission			
4	—	Bloody mucus	*B. Shiga, B. fluorescens*
5	Frequent	Very bloody mucus	,, ,,
6	5	Fæcal, bloody mucus	*B. fluorescens*
7	2	Fæcal, mucus	Cocci
8	5	—	*B. coli*
9	4	Fæcal, a little bloody mucus..	—
10	2	Normal	—

CASES OF DYSENTERY—*Continued.*

No serum.

Days of disease.	Number of stools per diem	Character of stools	Bacteriological report on stools
On admission			
4	—	Bloody mucus-pus	*B. dysenteriæ* (Shiga) and *B. dysenteriæ* (mannite fermenter atypical)
5	16	,, ,, ...	*B. dysenteriæ* (Shiga)
6	13	Fæcal, bloody mucus	*B. fæcalis alkaligenes*
7	16	More fæcal, muco-pus ..	—
8	10	Fæcal, more mucus	*B. Shiga, B. Morgan* 1
9	6	Mucus, pus	,, ,,
10	3	Fæcal, exudate and small sloughs	*B. Morgan* 1
11	5	Pus	,,
12	1	—	,, *B. fæcalis alkaligenes*
13	2	More fæcal, pus	*B. fæcalis alkaligenes*
14	2	—	*B. paracolon*
15	2	—	—
16	—	—	—
17	—	Normal	—

No serum.

On admission			
8	8	Loose fæcal	*B. dysenteriæ* (mannite fermenter atypical)
9	6	Much blood, muco-pus ..	—
10	8	Very bloody	*B. dysenteriæ* (Shiga)
11	8	Very bloody, mucus	—
12	5	Bloody mucus	*B. dysenteriæ* (Shiga)
13	4	Bloody muco-pus	*B. paracolon*, type
14	3	Fæcal, mucus	—
15	3	—	—
16	3	Fæcal, some pus	*B. dysenteriæ* (mannite fermenter atypical)
17	2	Fæcal, some pus and blood ..	*B. C.L.A.* 2
18	2	Fæcal, a little mucus and blood	*B. dysenteriæ* (mannite fermenter atypical) *B. fæcalis alkaligenes*
19	Enema	Fæcal, a little mucus.. ..	*B. dysenteriæ* (mannite fermenter atypical)
20	—	,, ,, ,, ...	—
21	3	—	*B. dysenteriæ* (non-mannite fermenter atypical) *B. C.L.A.* 2
22	4	Fæcal	—
23	Enema	—	—
24	—	—	—
25	3	Normal	Cocci only

No serum.

On admission			
2	7	Blood and mucus	*B. dysenteriæ* (Shiga)
3	18	Blood and mucus, fæces ..	,, ,,
4	13	—	,, ,,
5	Frequent	Blood and mucus	,, ,,
6	13	Fæcal, blood, muco-pus ..	,, ,,
7	10	Fæcal, less blood, exudate ..	*B. coli* type
8	6	Muco-pus, a little blood ..	*B. dysenteriæ* (Shiga) *B. fæcalis alkaligenes*
9	10	Bloody muco-pus	—
10	6	Fæcal, mucus, little blood ..	—
11	4	More fæcal	*B. fluorescens*

found, sometimes in enormous numbers;[1] and the question naturally arises as to whether these organisms can by themselves produce dysenteric symptoms.

A priori there is no reason to the contrary. A catarrh of the bronchi or of the bladder may be due to many organisms, though in each case, from reasons special to the viscus or to the common mode of infection, particular bacteria are most commonly found. It seems certain that these concomitant bacteria may be pathogenic in bowels already injured by a dysentery bacillus or *E. histolytica*, and not at all unlikely that they may produce the clinical symptoms of dysentery, i.e., colitis. The proportion of cases in which they are the sole infection is, in all probability, not large.

We have tried to elucidate the point by investigating the agglutinating action of the blood serum of fifty-three convalescent dysenteric patients. The results are indefinite and further examinations are required. Of ten cases where *B. dysenteriæ* Shiga was isolated from the stools during the acute stage, the serum of 5 agglutinated it in dilutions varying from 254 to 1,024; but in 5 only agglutinated up to 16, 16, 32, 32, 64. Of 8 *B. dysenteriæ* Flexner cases the agglutinative dilutions were 8, 8, 16, 128, 128, 160, 512, 1,024. So that agglutination reactions may be positive or negative in these forms of dysentery.

The reactions with the atypical bacilli are also indefinite. Of 7 cases, 6 agglutinated *B. Shiga* in dilutions of 16, 16, 32, 64, 320, 512; while *B. Flexner* was agglutinated in 4 cases with dilutions of 8, 16, 32, and 1,024. The particular organism isolated was agglutinated in 2 cases in dilutions of 128 and 1,024 and was not agglutinated in 3 cases.

Of 7 cases where *B. Morgan* 1 was alone isolated from the stools, 3 agglutinated *B. Shiga* in dilutions of 8, 16, 320; and 5 agglutinated *B. Flexner* in dilutions of 15, 40, 80, 256, 512. Of 7 cases where *B. fæcalis alkaligenes* was isolated from the stools, 2 agglutinated *B. Shiga* in dilutions of 256 and 512; and 2 agglutinated *B. Flexner* in dilutions of 32, 256. So that it seems certain that some of the cases in which the concomitant bacteria alone, or atypical bacilli, are isolated from the stools have been due primarily to infection by one of the classical dysentery bacilli. But as we have shown, classical dysentery bacilli are not invariably agglutinated by the serum of patients from whose stools they have been isolated, so that no conclusion can be reached.

While laboratory investigations are undoubtedly necessary to determine the type of dysentery prevailing in any particular locality, we must confess that the assistance which they can give to the physician in the treatment of an individual case is usually slight. As we have already indicated, no dysenteric bacilli were found in many of our most acute bacillary cases;

---

[1] Two thousand eight hundred and forty-two cases examined. "Concomitant" bacteria in 554 cases in which *Entamœbæ*, *B. dysenteriæ*, and *B. dysenteriæ* atypical were absent.—Report of Medical Advisory Committee.

and in many chronic cases coming from Mesopotamia, almost certainly of amœbic origin, who derived much benefit from emetine treatment, no amœbæ were discovered.

In a few cases valuable aid is rendered, but in the great majority the clinician must act without reference to bacteriological and microscopic findings. We have already stated that we are somewhat sceptical of the existence of *pure* amœbic dysentery. We are becoming equally sceptical of the existence of pure *chronic* bacillary dysentery. Our custom now is to treat all chronic or relapsing cases as amœbic in origin, whether entamœbæ or bacilli are or are not discovered in the stools. For without some form of ipecacuanha treatment an amœbic infection of the bowel almost invariably progresses, slowly, but surely; and its administration in bacillary cases is at any rate harmless. The fatal cases recorded above are sufficient evidence of the accuracy of our conclusion.

The value of anti-dysenteric serum in the treatment of dysentery is still *sub judice*. The serum is obtained by immunizing horses with various strains of the "classical" dysentery bacilli, and seems to have proved of value in certain epidemics of which presumably the classical bacilli were the cause. But some forty per cent of our bacillary cases showed atypical organisms, which did not react with homologous sera, and the value of the specific remedy is in consequence in question. The horse serum, of course, may be of use but that is beside the point.

We have used serum fairly freely in cases where we had reason to believe that the cause was bacterial and in which toxic symptoms were prominent, giving 40, 60, or 80 cubic centimetres as a dose and repeating it as seemed indicated. Our maximum total dose was 140 cubic centimetres. We have observed good results to follow its administration, but we have also seen equally good results in cases where from some particular reason no serum was administered.

It seems probable that the value of serum is greatest in the first three or four days of the illness, at the time when the specific infection is at a maximum, and prior to the formation of gross lesions in the bowel; and that it is of less or little value in the second week of the disease after ulceration has occurred and a multiple bacterial infection has taken place, It is probably of greatest value in cases that are toxæmic, and the degree of fever, the pulse rate, and the general appearance of the patient should be specially noted. The character and number of the stools are less valuable as a guide. A dose of less than sixty cubic centimetres is probably insufficient, and a second injection may be made on the following day. The results of bacterial examination must not be awaited before the serum is administered, for as we have already mentioned its value is greatest in the early days of an attack, and it takes three or four days to complete the bacteriological examination of a stool.

We have been unable to form a definite opinion as to the value of serum in the treatment of bacillary dysentery, for the cases which we have

observed were too varied in character on their admission to our wards to be truly comparable. We have, however, felt that in severe cases the possible benefits of its administration should not be withheld, especially as we have so far failed to observe any injurious effects to follow its administration. But we are convinced that the *general treatment of the case is of much greater importance than the administration of serum*, which should be used only as an adjunct to and not as a substitute for the general treatment.

Arthritis (Cases of Serum Arthritis are not included).

Arthritis occurred in seven cases of this series. In one case it was mild, the patient complaining of pain in his knees and ankles for about a week which interfered with his sleep and was increased by movement. The joints were tender but were not swollen. There was no fever. Recovery was rapid and complete. He had previously suffered from rheumatic fever on two occasions and had had a subacute recurrence three months previously, which did not necessitate his entering hospital. An attack of dysentery of mild type ensued on September 26, and by October 10 the stools were normal. On October 19, however, his ankles became tender, swollen and painful, and this lasted for a week. There was no fever, and his recovery was rapid.

The other cases were more severe and in a general way presented the same features, the arthritis being a synovitis with practically no peri-articular swelling, and being accompanied by fever.

A yeoman, aged 21, was admitted to hospital on September 19 with dysentery of a week's duration. There was then no fever, but the abdomen was tender and the stools, composed of bloody mucus, numbered fifteen on the day of admission. Improvement was rapid, and the stools were normal after September 29. He now, however, began to complain of pains in his ankles, though these seemed normal save that they were tender. On October 3, however, the right knee-joint was found to be distended with fluid and next day the left knee was similarly affected. He slept badly at night on account of pain. On October 6 the knee seemed in much the same condition, but the left ankle was now involved. On October 7 the left ankle was more swollen, while the knees were less tense. On October 9 the arthritis was subsiding, and the ankle seemed normal on October 12, though the knees were still involved. On October 16 the ankle again became swollen for a day or two, but his subsequent progress was good, and the joints were normal on October 22.

The patient was evidently suffering from a bacillary dysentery, but no specific organisms were isolated from the stools which, however, contained *B. fæcalis alkaligenes* and streptococci previous to the onset of the arthritis. The stools seemed normal at this time, and remained normal subsequently. The left knee was punctured on October 6, but the fluid was sterile. It was opalescent in colour with a large cellular content which on differential count showed polymorphonuclear cells 72 per cent; large mononuclear

4 per cent; small mononuclear 22 per cent: and endothelial cells 2 per cent (Captain W. Campbell). We have only had cultures made in one other case where the left knee-joint alone was involved. In this case *B. coli communis* was isolated. We were inclined to regard this as due to some accidental contamination, but Phillips has recorded a similar case, which suggests a causal relationship.

Three other cases were of similar type. They were all apparently bacillary dysenteries, but cultures were only positive in one case where an atypical mannite non-fermenter bacillus was detected. Before this patient left hospital a mild recrudescence of dysenteric symptoms ensued, and the *E. histolytica* was discovered, so that the infection was probably mixed at the outset. In none of the other cases were entamœbæ found. The records in one case are unfortunately missing. This was the patient from whose knee-joint *B. coli* was isolated. He was inclined to athletic pursuits, and had had traumatic synovitis on two previous occasions. Another patient, whose arthritis developed on the eighteenth day of his dysentery at a time when the stools still contained some cellular exudate, had been laid up for a month with rheumatism in the knees eighteen months previously. The joints affected were the knees and the right metacarpo-carpal joints; the arthritis persisted for nearly six weeks, though the fever was slight (100° F.) and disappeared after three weeks. In the sixth case the arthritis ensued on the twenty-first day, the knees and the proximal joint of the right great toe being involved. The fever touched 101° F. and lasted for twelve days, while the arthritis lasted for seventeen days. The stools at the outset still contained some cellular exudate.

We have little doubt that the arthritis in these cases was the result of the gastro-intestinal disease and due to a bacterial infection of the joints. We have, unfortunately, little information with regard to the bacterial contents of the joints either in our own cases, or in the scanty literature on the subject. We have no evidence as to the presence of dysenteric organisms in the effusions which might quite well be due to infection by the "concomitant" bacteria, or by *B. coli*. But we are convinced that these cases are not merely examples of acute rheumatic fever occurring in persons who happen to be at the time convalescing from dysentery. There is little or no peri-articular swelling, the pain is slight as contrasted with the signs of arthritis, profuse sweating does not occur, and the cardiac valves are not involved; while the arthritis does not react to salicylates in the rheumatic fashion, though this drug undoubtedly mitigates the discomforts. The comparison is rather with gonococcic arthritis, and in both cases recovery is incomplete until the primary source of the infection has been cured. None of these patients showed any signs of recent gonorrhœa, and in no case had serum been administered.

In another case the sequence was not quite so clear as the arthritis occurred in a patient who had been liable to "rheumatism in the joints"

for several years, and may thus have been a recrudescence of a pre-existing disease. He was a man aged 47. The diarrhœa ensued on October 4, 1916, and blood and mucus appeared in the stools on October 6, but disappeared after October 14. *B. C.L.A.* 2 alone was isolated from the stools. His tongue was slightly coated during his residence, but otherwise gastro-intestinal symptoms were in abeyance.

The arthritis commenced on October 14, when the knees and ankles became painful and tender. Two days later the right knee and ankle became swollen, a considerable effusion taking place into the knee-joint. These symptoms decreased after a couple of days, but did not disappear, and on October 22 the joints of the right foot, the metacarpo-phalangeal joints of the right hand and the right elbow became involved. On his dismissal to England on December 7, 1916, his symptoms were much abated, but there was still some fluid in the knee, and the ankle, elbow and hand were still swollen. He had slight fever on admission, which became intensified from October 15 to November 1, and persisted in slight degree until dismissal.

The history of the case and its subsequent course suggested an acute relapse of a chronic rheumatoid arthritis rather than an attack of "dysenteric" arthritis.

	Age	Previous history	Infection	Joints involved	Date of arthritis	Duration of arthritis	Fever	Duration of fever	Character of stools	Effusion	Serum
					Day	Days		Days			
(1) W. ..	27	Rheumatism of knees 18/12 previously	*B. dys.* M. F. *Ent. hist.*	Knees, ankles, right metacarpo-carpal joints	18th	40	Yes	17	Abnormal	?	—
(2) D. ..	31	—	—	Knees, ankles	21st	7	—	—	Normal	None	—
(3) D. ..	20	—	—	Knees, phalangeal joint of right great toe	21st	17	Yes	12	Abnormal	?	—
(4) L. ..	21	—	*B. fæcal. alklig.* Streptococci	Knees, ankles	19th	21	Yes	12	Normal	Sterile	—
(5) Y. ..	23	Several attacks of rheumatism	—	Ankles	23rd	6	—	—	Normal	?	—
(6) S. ..	?	Traumatic synovitis	—	Left knee	?	?	—	—	?	*B. coli*	—
(7) ..	47	Rheumatism for several years	*B.C.L.A.2*	Right knee, ankle, foot, elbow and hand	10th	54	Yes	54	Normal	Yes	—

Cardiac Symptoms.

We have been unable to recognize any cardiac symptoms which are peculiar to dysentery, although cardiac symptoms are not infrequently prominent. In dysentery we are dealing with a disease in which toxic symptoms are not uncommon (bacillary dysentery), and in which in consequence the pathological lesions (granular and fatty changes) which obtain in all the affections are almost certain to occur. In dysentery the physical exhaustion entailed by the frequent call to stool, the abdominal pain, and the loss of sleep is very considerable; and the muscular weakness which is so well-marked in early convalescence in the muscles of the limbs, will naturally obtain also in the cardiac muscle, and will be intensified by exposure, hard physical exertion, etc., such as occurred on the Peninsula and in Mesopotamia. A long railway journey, a rough sea voyage, and even the carrying of a heavy kit at the railway station, have all in our experience produced serious cardiac symptoms of a temporary kind; while at the present time our armies contain many men of under average physique who have previously been engaged in sedentary occupations, as well as many where cardiac reserve has been previously weakened by antecedent disease of varying character, in whom the breaking strain is necessarily small. We have seen patients with œdema of the extremities, with dyspnœa or palpitation upon exertion, dizziness, faintness, and the like; we have observed dilatation of the heart, mitral reflux and extra-systoles on several occasions. But we have not met with any cardiac disability which we have not seen in pneumonia or in enteric fever; and the proportion of cases in which such symptoms have been present does not seem to us to be nearly so large as in the former disease. We have not seen any cases of heart-block, auricular fibrillation or auricular flutter, and we have not seen any cases of acute endocarditis.

In acute dysentery it is essential to prevent cardiac strain in every possible way. The bedpan must be substituted for the latrine, and in serious cases even the bedpan should be forbidden and the evacuations passed into pads. Careful nursing, too, is of the greatest value. When stimulants are required we have found alcohol, ammonia, and digitalis of value.

The Relations of Enterica and Dysentery.

There has been considerable discussion as to the relationship of dysenteric symptoms and enterica, as the former were not infrequently present in cases shown to be enterica by bacteriological methods. The question was brought to our notice by the following case :—

The patient, who had not previously been out of England, was attacked by dysenteric symptoms, accompanied by fever on June 9, 1916, and when admitted into hospital on June 13, 1916, was passing many stools which were wholly composed of rose-coloured mucus. This continued for four days, when the blood disappeared, the stools still containing muco-pus.

On June 24, 1916, the stools were normal and he seemed convalescent, the fever which was present on admission having gradually fallen and reached normal on June 21, 1916. The general symptoms, headache, prostration, etc., had also disappeared. On June 25, however, the fever recurred, accompanied by a measly rash and arthritic pains—a serum reaction which had followed the administration of eighty cubic centimetres of serum on admission. On June 28 the serum rash and arthritis had disappeared, but the fever persisted, the spleen was enlarged and some rose-coloured spots were present on the trunk. A blood culture gave a pure culture of *B. paratyphoid* A. The fever persisted until July 3, 1917. The patient made an uninterrupted recovery. No dysenteric symptoms were present during the second febrile attack.

We at first looked upon the case as one of bacillary dysentery, followed by enterica, the infections being simultaneous, while the attacks followed in sequence owing to the varying length of the incubation period in the two diseases. But dysenteric bacteria were not detected in the stools during the primary attack, and Colonel O'Sullivan suggested that the two illnesses might be due to the same infection, the first attack chiefly involving the lower bowel, while in the relapse the lower bowel escaped. Two similar cases shortly afterwards came under our notice.

A definite conclusion cannot be reached in this case as a blood culture was not taken during the initial attack. The blood when subsequently tested for agglutinative reactions to *B. dysenteriæ* Shiga, Flexner and Y failed to show any reaction. The dysentery may, of course, have been due to atypical organisms. We have shown, too, that positive agglutinative reactions are by no means constant in bacillary dysentery.

In enterica the large bowel is sometimes notably affected. We have seen well-marked ulceration of the colon, extending even as low as the descending colon, both at home and in South Africa, and another case has recently come to our notice. In this patient, who died from perforation and peritonitis, the usual ulcers were present in the small intestine; one ulcer about the size of a split pea was present in the cæcum; and several large ulcers were present about the splenic flexure and in the descending colon. The pelvic colon and rectum were not involved. Captain W. Campbell considered the whole condition to be enteric in origin. *B. typhosus* was isolated in culture from the blood during life. No dysenteric symptoms were present during his residence in hospital.

The literature which we have been able to consult shows that ulceration of the large bowel is not uncommon in paratyphoid infections. In Stolkind's series ten of one hundred cases showed lesions similar to those of dysentery. Job and Ballet record a case in which there was deep ulceration of the sigmoid flexure and rectum. In Dawson and Whittingham's cases nine out of seventeen showed some ulceration in the large bowel. Rathery also found ulceration of varying depth and size in the colon.

We have had considerable experience of enteric fever both at home and in South Africa, but we have not met with the combination of dysenteric symptoms and enterica until we encountered it in Alexandria.

During 1915 dysenteric symptoms were not uncommon in Alexandria among the enterica cases. In the majority, however, they were the result of a double infection with *E. histolytica* and *B. enterica*. Captain Ford has recorded thirty-four cases, and in thirty-two of these a definite amœbiasis was shown to be present on examination of the stools. Captain Dunne had a similar experience. We have already recorded a case in which the two infections co-existed.

The co-existence of bacillary dysentery and enterica has only been noted in a few cases. One occurred in Captain Dunne's wards, the two organisms being isolated at the same time from the blood and from the stools. But, as we have shown, the *B. dysenteriæ* is not detected in the stools in a majority of cases which are clinically bacillary dysentery; so that the failure to isolate *B. dysenteriæ* from the stools of cases of enterica in whom dysenteric symptoms are present can hardly be reckoned to exclude their presence.

We have habitually taken blood cultures in our febrile cases of bacillary dysentery, but the results have been consistently negative.

We have been unable to find much information upon the point in such literature as we have been able to consult. Carles, however, has recorded a case in which he recovered *B. paratyphoid* A from the blood of a fevered patient who was on admission passing many stools composed of bloody mucus. No dysenteric organisms were found in the stools.

Captain Hirst informs us that an epidemic of dysentery which occurred at Wrexham about 1911 was due to a paratyphoid infection. We have been unable to consult the reference.

On the available data we are inclined to look upon the occurrence of dysenteric symptoms in cases of enterica as due to a coincident infection with *E. histolytica* or *B. dysenteriæ*.

Lamblia Intestinalis.

The influence of *Lamblia intestinalis* upon the gastro-intestinal functions is still undetermined. It is frequently present in the stools of patients suffering from diarrhœa, dysentery, etc., and was peculiarly prevalent among the troops evacuated from the Peninsula on account of these diseases. But it is often found in the stools of patients who have not at the time any intestinal symptoms or in whom, though symptoms are present, other possible causes for their existence are at the time active, or have been active in the immediate past.

The confusion which arose as to the nature of the dysenteries prevalent in 1915-1916 in the Eastern Mediterranean was due to a simple cause, namely, the incomplete examination of the stools. In many cases the

examination was purely microscopic, in others purely bacterial, and opinions were formed on an imperfect knowledge of the facts. In some cases the gastro-intestinal tract is heavily infected (in one of our patients *E. histolytica*, *Lamblia*, *B. dysenteriæ* Shiga, *B. fæcalis alkaligenes*, *B. paracolon* 2, *B. C. L. A.*, and streptococci were isolated within a few days from the stools), and the influence of any particular parasite in the production of the symptoms which are present can hardly be estimated. But the opinion is gradually forming that in some cases Lamblia may be the cause of chronic diarrhœa, and in a few patients may produce symptoms closely simulating dysentery. Lieutenant-Colonel Wenyon "suspects that sometimes at any rate it may produce sufficient irritation of the small intestine to justify us in regarding it as pathogenic." Dr. Fantham and Miss Porter consider that "it is pathogenic to man and is capable of producing diarrhœa." They have shown too that it is pathogenic to kittens and to mice. Major Hurst thinks that in some cases Lamblia is probably the cause of gastro-intestinal symptoms.

We have examined our own records from this point of view but are unable to arrive at a definite conclusion. In dysentery, Lamblia is not infrequently present in the stools, and in our series was detected in more than fifty cases, either in the free state or encysted. In the large majority, however, their presence was intermittent, and intestinal symptoms were at the time either slight, or in abeyance.

In eleven cases, however, intestinal symptoms were present and a causal relationship was possible. Analysis of these cases unfortunately fails to give any decided answer to the question, for in eight cases other infections were either simultaneously active, or had been active immediately before. In three cases an amœbic infection was noted. In two a bacillary infection, and in three tetramitus.

In three cases alone was the infection pure. One of these patients had been ill, off and on, for many months and had almost certainly suffered from amœbic dysentery at the outset, though entamœbæ were no longer present in the stools. The second patient was admitted acutely ill with dysentery probably of bacillary origin, though no bacilli were isolated from the stools, and subsequently showed a Lamblia infection associated with diarrhœa. In the third, the symptoms seemed probably to be due to Lamblia.

In five cases an association between the Lamblia infection and the symptoms seemed extremely probable, though other infections co-existed. The most striking example was that of a patient who had suffered from dysentery in May, June and July. After his admission to hospital, *B. dysenteriæ* Shiga was found in the stools on July 10, and on August 3, 1916. Entamœbæ was detected for the first time on August 19, and a course of emetine hypodermically and ipecacuanha by the mouth was immediately instituted. This ended on August 31. Considerable improvement had ensued during the course, but on August 30 he passed three stools which

contained mucus in very large amount. Many Lamblia, both free and encysted, were present, but no other protozoa or bacteria, though the stools were examined on August 30, 31, and September 1, 3, 5, 6, 7, 8, 9, 11, 13. The Lamblia infection was last detected on September 3, and the symptoms rapidly disappeared.

In the other cases the stools were of different type. Some mucus was generally present, but never in large amount. The stools were numerous, very bulky and much larger than one would have anticipated considering their number. They were of varying colour, ochre, brown, or grey, and very often showed evidences of fermentation in the shape of bubbles of gas scattered here and there throughout them. Sometimes they were orange coloured, but this is not pathognomonic for we have seen such stools in cases where Lamblia was never present.

In the second case a mannite-fermenting bacillus had been isolated a short time previously. In the third *B. fæcalis alkaligenes*, in the fourth *B. paracolon*, in the fifth tetramitus, co-existed. But in all these cases disappearance of the Lamblia coincided with remission of the symptoms.

The presence of Lamblia in the stools is peculiarly intermittent and they appear and disappear even from day to day, so that their causal relationship to any symptoms that may be present is still further confused.

We are inclined to believe that, although in the majority of cases Lamblia is innocuous, in a minority they can produce symptoms which somewhat closely simulate dysentery, a result which is more likely to obtain if other pathogenic organisms co-exist, or have recently been active.

The treatment of Lamblia infections requires further investigation. It is comparatively easy to remove them temporarily by the administration of bismuth salicylate in sixty-grain doses three to six times a day. Any coincident diarrhœa generally ceases rapidly. But the Lamblia as a rule reappear when the salicylate is stopped, sometimes within three or four days, though now frequently without any objective symptoms.

In three of our cases, however, the infection seemed to be completely removed. One of our patients received forty-five grains of sodium salicylate for twelve days, followed by 180 grains of bismuth salicylate for thirteen days. The second received forty-five grains of the sodium salt for twelve days and after an interval of eight days 180 grains of the bismuth salt for twenty-nine days. The third patient received 180 grains of the bismuth salt for fourteen days.

We know, however, that the infection may not be eradicated by 180 grains given for seventeen days, and we would suggest that a three weeks' course be investigated.

With such large doses of salicylate we thought it advisable to confine the patients to bed. We have seen no ill effects in any of our patients.

Treatment.—One is apt to forget—in the treatment of dysentery—that we are confronted with *two* problems, (1) the local condition, and (2) the general health of the patient, factors which of course act and react upon

each other, but which demand in some respects separate consideration, and a separate line of treatment. In some instances one factor is predominant. In the early stages, for example, the local condition demands a starvation dietary. But in a later period of the disease the general health may be the chief consideration and a dietary which is not conducive to minimal irritation of the bowel may be forced upon one by the failure in nutrition as a whole. In every case and at every period of the disease due attention must be paid to this point.

The general health is investigated in the usual ways. The local condition can only be watched by similar methods and the tongue must be clean, the abdomen flat, painless and no longer tender, and the stools normal before the attack can be considered as ended. Too much attention cannot be paid to the investigation of the stools and the treatment must be largely directed by daily observation of them. And even on the same day the character of the stools may be varied and erroneous deductions may be drawn if an isolated sample is alone examined.

The first indication in treatment is rest. This can of course be only relative but the good effects of confinement to bed and the use of the bedpan are at once manifest. In serious cases even the bedpan should be avoided and the stools should be passed into pads of tow or cotton wool. In dysentery the nights are disturbed by pain, tenesmus and calls to stool, and opium in some form (morphia, laudanum, chlorodyne) is of great value, not of course with a view to checking diarrhœa, a process which invariably produces an exacerbation of the symptoms after a temporary improvement, but to ensure some sleep and at the best a "short night" instead of a "long one." We prefer a hypodermic injection when the pain is severe, and an oral one if diarrhœa is profuse. Abdominal applications, a hot water bottle, hot compresses sprinkled with laudanum, antiphlogistine, etc., are also comforting and of undoubted value.

The diet in dysentery is of great importance. The general indications are definite. It should be unirritating, and well digested; should afford a small and bland food residue and be as valuable as possible from the nutritional point of view. It has been said that the character of the foodstuffs matters little as they have reached a similar consistency whatever their original nature by the time that they have reached the ileo-cæcal valve, but repeated observations have convinced us of the fallacy of this statement. Regular inspections of the stools reveals in many cases extraordinary evidences of the inefficacy of oral and gastric digestion even in cases where no obvious oral or gastric disturbances are apparent. Ration bread, for instance, and potatoes are often easily recognizable in the stools, sometimes in considerable masses; as well as such things as raisins and the seeds of fruit. We have found it advantageous to eliminate cellulose from the diet until improvement is distinct. The foodstuffs must be such as are well digested, for the presence of undigested food in a heavily infected bowel leads to the formation of products which from their chemical

character are definitely irritating to the bowel; and their nutritional value should be fully considered, as malnutrition is an early and marked feature in every case of dysentery.

The accompanying dietaries show in detail the lines that we have adopted, and may be taken as examples of the general principles. The early dietaries are of course a starvation regime, but this has been adopted by us not from *a priori* theories but from practical experience in the wards; the later dietaries are excessive. These too have been adopted as the result of observation for we have often seen a loss in weight of over a stone after a comparatively short but sharp attack.

DIETS IN DYSENTERY.

Diets No. 1 and No. 2 in detail.

No. 1.		Ounces	No. 2.
6 a.m.	Tea	.. 10	Tea.
7.30 ,,	Albumen water	.. 6	Two beaten-up eggs with tea and rusks.
9 ,,	Brand's Essence	.. 6	Barley water.
10.30 ,,	Barley water ..	.. 10	Benger's.
12 noon	Beef tea ..	.. 10	Beef tea. Custard or rice cooked in water.
1.30 p.m.	Albumen water..	.. 6	
3 ,,	Jelly.		2 p.m. Jelly.
4.30 ,,	Tea	.. 10	Tea with rusks and biscuits.
6 ,,	Chicken tea ..	.. 10	Chicken tea or bovril.
8 ,,	Albumen water..	.. 10	Benger's or arrowroot.
10 ,,	Bovril	.. 10	Brand's essence.
12 midnight	Brand's Essence	.. 6	Albumen water.
2 a.m.	Barley water ..	.. 10	Bovril.
4 ,,	Albumen water..	.. 10	Benger's.

No. 3. Add. Eggs boiled or poached and junket or milk foods (Horlick's, Allenburys', etc.).
No. 4. Add. Fish cream, rice milk, puddings and toast.
No. 5. Add. Fish and bread.
No. 6. Chicken diet at first without potatoes, vegetables or porridge.
No. 7. Ordinary diet.

Note.—Articles mentioned in later diets gradually displace those in earlier diets. Milk—citrated or peptonized—and chocolate were at times given with No. 2.

The chief indications in the selection of the sequence are the state of the tongue and the character of the stools. Even milk is badly borne if the tongue is coated, and an ample dietary can rarely be tolerated until the third type of stool is being passed.

The dietaries are of course but types. They were drawn up according to the possibilities of the situation and are capable of considerable improvement both in variety and in quality, in times of peace.

Fluid should always be given in ample quantity in particular during the stages of severe diarrhœa so as to compensate the loss of water. But quite apart from this, fluid in amount is desirable in order to dilute the poisons circulating in the blood and to aid in their elimination through the kidneys.

One exception may be noticed. During convalescence in a few cases diarrhœa of a watery type may persist indefinitely though the other symptoms have abated. We have seen considerable improvement follow the institution of a relatively dry dietary with a reduction of the fluid intake.

The Use of Drugs in Dysentery requires some Detailed Attention.

Diarrhœa.—One is always tempted to try and check diarrhœa in cases of dysentery, for the symptom is extremely distressing to the patient and by its continuance severely affects his nutrition and increases his exhaustion. But the current opinion, founded not on theory but on practical experience, holds strongly that any attempt in this direction is in the long run not only injudicious but is actively harmful. Patients who are being transferred from one unit to another are generally given a comparatively large dose of opium to ensure the minimum distress during the journey; but those who have witnessed the subsequent course of the disease in these patients are convinced that the temporary amelioration is dearly bought and is usually followed by a recrudescence or an exacerbation of the symptoms.

This applies not only to the cases in which the stools contain blood and mucus, but also to those in which "running diarrhœa" succeeds. For these cases of diarrhœa are truly, as has been well said, merely uncured dysentery, and require treatment of a type similar to that of the acute stage. The theory follows the fact. No one nowadays attempts to check the discharge of a septic wound by means of a gauze plug; on the contrary free drainage and irrigation are ensured, and in dysentery the same indications obtain. The bowel should be freely washed out and the bacteria and their products removed as thoroughly and as rapidly as is possible. One must remember that the former are largely situated *in* the wall of the bowel and the profuse secretion secured by the sulphates probably helps their evacuation from this site as well as removing the secretions in the lumen of the bowel. Free evacuation is desirable until some fæcal material appears in the stools; and subsequently a daily wash out is advisable. We usually give drachm doses of the sulphates every four hours in the early stages and subsequently an efficient dose each morning.

Regular inspection of the stools affords the desired information with regard to this point. If in doubt a "washed" stool may make the matter more clear.

The rule has of course an exception. In some cases where the stools indicate a minimal catarrh though the diarrhœa continues, small doses of opium are of undoubted value. But these cases are relatively uncommon.

The value of opium in the treatment of dysentery is, however, un-

doubted. But it is as a sedative—given at night—to ensure some rest and sleep that its beneficial action is most apparent.

We have used many of the astringent drugs in these cases and we have found that their value lies in conditions similar to those which we have just considered. It must always be borne in mind that these drugs tend to irritate the gastric mucous membrane and can rarely be continued with benefit for more than a few days.

Bismuth.—We agree with most writers as to the value of this drug. We give it regularly in large (ʒi) doses every two, three or four hours during the acute stages of the illness and subsequently in lessening amount. The carbonate of bismuth must be given; the subnitrate is of course poisonous in such doses.

Tragacanth mixtures are unsatisfactory. A watery mixture or a suspension in thin arrowroot are the best means of ensuring equality of dose.

A curious fact may be noticed here. In cases which are improving the administration of bismuth leads rapidly to blackening of the stools. In the acute stages, however, while blood and mucus constitute the motion no blackening obtains. This is probably due to the cessation of the peristaltic movements of the small intestine, as a similar result has been noticed by one of us after the administration of powdered charcoal. As improvement ensues, the stools become black and the discoloration may be taken as an index of the satisfactory progress of the case. The absence of discoloration on the other hand indicates incomplete evacuation of the bowel and demands treatment. Castor oil is generally efficacious if increased doses of the sulphates fail and we have often seen extraordinary improvement follow its use.

It has been suggested that this phenomenon is an indication that the lower bowel requires rest—rest which is spontaneously effected by cessation of peristalsis higher up; and that the saline treatment must therefore be harmful. Our own experience, however, as well as that of most writers on the subject, flatly contradicts this theory and we are convinced that the absence of blackening of the stools on this administration of bismuth is merely an extra indication for the continued use of the aperient sulphates.

These drugs, however, can easily be given in too large doses; what is indicated is evacuation of the unutilized contents of the bowel, and if diarrhœa succeeds the acute phase a dose every second or third day may be efficient for this purpose.

Enemata are often of value. During the acute stages they are as a rule contra-indicated. In certain cases, however, when tenesmus is extreme, a wash out with warm normal saline solution is sometimes soothing. The douche must be given very slowly at blood heat, and more than a pint or a pint and a half is rarely tolerated.

In the later stages, when the catarrh is subsiding, douches are often valuable. They are of especial value when the presence of unaltered

mucus, blood or pus around normal fæces indicate that the inflammatory process is situated low down. Two or three pints may be given in these cases, but the flow should be checked if any discomfort or pain is caused. The long tube is probably not required if the flow is slow and the pressure slight, and we generally use the nozzle of an ordinary Higginson's syringe attached to the end of the douche tube.

We have used most of the solutions that are usually recommended for this purpose, and we have found little difference in the results that we have obtained. It seems probable that the mechanical part of the process is the most valuable and that the sterile saline solution serves the purpose as well as anything else. The addition of a drachm of sodii bicarb. to the pint may facilitate the removal of mucus from the wall of the bowel. Eusol and saline in equal parts is another bland and efficient douche.

In protracted cases silver nitrate seems sometimes of value. Protargol (five per cent) is perhaps equally efficacious and is less painful. The bowel must of course be washed out previously with saline solution to remove mucus, etc., and permit of the silver salt gaining access to the tissues.

The sedative applications such as starch and opium enemata, morphia suppositories, etc., are sometimes useful if tenesmus is marked, but we prefer the hypodermic injection of morphia and atropine in efficient doses.

In protracted cases the lower bowel should be examined with the fingers and the proctoscope to ensure local treatment of local lesions near the anus. We have found on two occasions constrictions in these cases. In one of these the stricture disappeared after dilatation and a course of emetine. Entamœbæ were not recognized in the stools and the emetine was administered on general grounds. In the second case the stricture was thin and diaphragmatic and did not recur after dilatation. The ultimate progress was good.

In a small number of cases of acute dysentery the symptoms are choleraic in type, vomiting and diarrhœa being continuous and severe. The patient rapidly becomes collapsed with small thready pulse, cold extremities, cyanosis and subnormal temperature. The indications in such cases are of course obvious and the most important is the supply of saline solution by intravenous injection as in cases of true cholera.

In a certain number of cases of acute dysentery similar symptoms obtain though vomiting may be absent or minimal in degree. The good results which we have observed in cases of the choleraic type have led us to use intravenous injections when the indications were similar, though the degree of the disturbance was less severe, and the good results which we have observed have encouraged us to adopt the treatment more and more frequently. We have throughout used the hypertonic saline solution recommended by Rogers and supplied to the Service in the cholera outfit. Three or four pints has been our usual dose. In some cases we have added antidysenteric serum to the saline solution.

One further point requires to be mentioned. The more that we see of dysentery the more firmly are we convinced that the successful treatment of dysentery depends upon the treatment during the first few days of the disease. And if efficient treatment can be attained in the first forty-eight hours not only will the mortality be lessened, but the duration of the illness will be notably shortened and the efficiency of the fighting forces will be appreciably increased. No case of dysentery however slight at the outset should be treated lightly. If this rule is neglected serious symptoms will subsequently ensue in a considerable number of cases.

In conclusion, we desire to express our indebtedness to Colonel O'Sullivan, A.M.S., who from his ripe experience has given us much advice and assistance in dealing with the problems of dysentery, and to Captain R. H. Strong, who as head of the medical division of this hospital, has given us every facility for carrying on our work and has helped us in every way, and also to Captain Mackie and his colleagues at the Military Bacteriological Laboratory, Alexandria, for the bacteriological work they have kindly undertaken for us in connexion with this paper.

CASTELLANI'S ABSORPTION TEST.

By Captain W. BROUGHTON ALCOCK.
Royal Army Medical Corps.

The difficulties which have appeared when carrying out this highly specific and valuable test on human sera during and after infection or mixed inoculations have been great. Various and instructive researches have since Castellani's original work been carried out in England, especially by Boycott, Bainbridge and O'Brien, Cummins and Cumming. Because of its utility and aid, not only in the classification of agglutinins, but in the determination of particular strains of a group, an attempt has been made to devise a simple, practical, and reliable method of carrying it out as part of the routine work of the clinical laboratory. The method to be described has been developed from tests made during eighteen months on the blood sera of some 300 bacteriologically diagnosed and on other cases of single or multiple infections, and on inoculated subjects. Comparative agglutination examinations were made on the slide by the method described in a previous paper (see Journal of the Royal Army Medical Corps, April, 1918) before and after the absorption test, to distinguish the action of one or more specific agglutinins from that of co- or hetero-agglutinins.

Harvey and Wood (Journal of the Royal Army Medical Corps, 1910) showed that an excess of micro-organisms other than *Bacillus paratyphosus* A removed or reduced the amount of detectable specific agglutinin for *B. paratyphosus* A present in the serum. I have confirmed and extended this observation by proving that in a similar manner supersaturation of a serum with other than the corresponding emulsions removes or reduces the detectable specific agglutinins for *B. dysenteriæ* Shiga, Flexner-Hiss, and *Micrococcus melitensis*. I was therefore led to experiment with previously determined quantities of the factors employed in the test, and have endeavoured to evolve a method which would include in its technique the utilization of a *practically defined amount of micro-organisms and a practically defined agglutinin content of a serum*, and find that the following technique gives constant and reliable results.

Technique.—The *quantity of micro-organisms* employed is one drop ($\frac{1}{2}$ minim or $\frac{1}{36}$ of a cubic centimetre) of an emulsion standardized as described in the paper on agglutination.

The *dilution of serum* employed is that which shows on the slide the onset of agglutination of an emulsion of micro-organisms at approximately one minute of time. [On the same principle a defined quantity of agglutinin in human serum for each emulsion could be tried by the selection of a particular dilution of serum from amongst those showing a positive finding in the agglutination test done by the examination of a series of

increasing dilutions for each emulsion by my three full minutes' test on the slide or the old-established high-titre method.]

From three drops of this dilution one drop of the stock emulsion corresponding to the micro-organism of infection (and which has caused the development of the specific and any co- or hetero-agglutinins), removes or sufficiently reduces all these agglutinins; while one drop of any other emulsion that was agglutinated by reason of the presence of co- or hetero-agglutinins developed during the infection, removes only the respective co- or hetero-agglutinin. After absorption by an emulsion, the serum dilution is re-examined for agglutination on the slide with the fixed time limit of three full minutes.

Very rarely a particular dilution of serum from a case shows the onset of agglutination of two or three different bacterial emulsions at approximately one minute. It is, therefore, practically always necessary to put up two or three series of sedimentation tubes, each series containing the desired dilution of serum for one of the emulsions that is to be tested: and at the same time each of the other agglutinated emulsions is tested in that dilution.

An example will make clear the technique and the principles of the method. In the initial time-governed agglutination test on the slide, the serum of a patient is found to agglutinate three emulsions—*B. dysenteriæ* Shiga, *B. paratyphosus* A, and *M. melitensis*. To carry out the absorption test on the lines described it is found that respective dilutions of the serum are to be prepared and that *B. dysenteriæ* Shiga begins agglutinating at approximately one minute in a 1 in 6; *B. paratyphosus* A in a 1 in 160; and *M. melitensis* in a 1 in 10 dilution of the serum, then three series of the sedimentation tubes must be put up. In each tube of the first series three drops of the serum dilution 1 in 3 is placed; into each of the second series three drops of the serum dilution 1 in 80; into each of the third series, three drops of the serum dilution 1 in 5; into one of the tubes of each series is placed respectively one drop of emulsion of *B. dysenteriæ* Shiga, *B. paratyphosus* A, and *M. melitensis*. To each tube is then added two drops of sterile formalized saline. That the drop containing the emulsion may contain as nearly as may be practicable the quantity of saline necessary to make the dilution in the absorption tube equal to that in the control tube, the pipette, during the dropping of the emulsion is held at an angle of approximately 67½°.

A few drops of each serum dilution corresponding to that in each series are prepared in three other tubes, and kept each alongside the absorption test tubes of the series, so that each dilution can be later tested to control and compare its agglutinability with that of the absorbed serum dilutions in the other tubes of the same series.

The tubes when ready are gently shaken and capped with plasticine to prevent evaporation. They are left for twenty to twenty-four hours at laboratory temperature, or seven to eight hours at 37° C., or for two hours

at 55° C. The tubes containing emulsion were gently shaken once during these intervals, when left at laboratory or 37° C. temperature.

The tubes are then centrifuged, and a drop of the clear supernatant fluid of each tube of the first series is tested on the slide with a loopful of emulsion of *B. dysenteriæ* Shiga, a drop from each tube of the second series with a loopful of *B. paratyphosus* A and a drop from each tube of the third series with a loopful of *M. melitensis.*

Taking the first series, if there is specific agglutinin present in the serum for *B. dysenteriæ* Shiga the emulsion of *B. dysenteriæ* Shiga will be agglutinated at approximately one minute in the fluid from the tube containing *B. paratyphosus* A, and from the tube containing *M. melitensis.* If, however, the agglutination of *B. dysenteriæ* Shiga is due to a hetero-agglutinin action developed in a *M. melitensis* infection, the *B. dysenteriæ* Shiga will be agglutinated only in the fluid from *B. paratyphosus* A as the emulsion of *M. melitensis* will remove the hetero-agglutinin for *B. dysenteriæ* Shiga, and that of *B. dysenteriæ* Shiga will remove the agglutinin for itself.

Observations are then made on the second series of tubes to determine the specificity or otherwise of the agglutinin present in the serum for *B. paratyphosus* A, and on the third series to determine that for *M. melitensis.*

Simpler tests are more often called for, and the technique modified accordingly.

There is the possibility of pathogenic micro-organisms other than those of the seven groups represented and employed in the initial agglutination tests giving rise to a co- or hetero-agglutinin which might cause agglutination of one of the emulsions employed, but up to the present this has not occurred.

In rare dysentery cases strains approximating in biological characters to typical strains of the *B. dysenteriæ* Flexner-Hiss group have been isolated and found to be agglutinated by the patient's serum and not by specific Flexner-Hiss animal anti-serum. Of these particular strains each absorbed the agglutinin from the patient's serum but did not absorb the agglutinin from the Flexner-Hiss specific animal anti-serum, and the converse held when employing a typical agglutinating strain of *B. Flexner-Hiss.* This result appears of value in view of the work upon similar strains of *B. dysenteriæ* obtained both in France and in the Mediterranean.

A specific agglutinin may be distinguished from a co-agglutinin in infections with one of the enterica groups; and the presence of specific agglutinins to more than one group may be detected. Again, I was able by this test to distinguish the specific agglutinin for *B. aertrycke,* developed in nine bacteriologically proven cases, from the agglutinin for a *B. paratyphosus* B strain due to previous T.A.B. inoculations. An emulsion of *B. Gaertner* did not remove either agglutinin.

This method also showed that the specific agglutinin for *B. typhosus*

developed in serum in response to anti-typhoid vaccine inoculation might be temporarily increased by inoculation with anti-paratyphoid vaccine.

In the experiments carried out in developing this method it was found that specific agglutinins for *B. typhosus* or *B. paratyphosus* B were not reduced by supersaturation with any other emulsion tested than their respective emulsion. This fact permits the use of the supersaturation absorption test to determine if specific agglutinin for *B. typhosus* or *B. paratyphosus* B is present in a given serum.[1]

Immediate Absorption Test.—Occasionally but rarely it is noted in carrying out the initial slide agglutination test that two or three emulsions are agglutinated in such a manner as to indicate that an absorption test may be *tentatively* carried out on the slide. Useful information may be gained where serological tests are urgently called for.

From my limited experience of this immediate test and from the tentative work, it appears that one should use a dilution of serum that shows the onset of the *complete* agglutination of the emulsion to be tested at any time within the range of thirty to ninety seconds. The agglutinin content of the serum is not then too high for its necessarily sufficient absorption.

To give an example. In a *M. melitensis* infection it was found by the initial slide agglutination test on the serum that *V. choleræ* and *M. melitensis* emulsions were agglutinated immediately into rather marked flocculi, leaving the serum dilution clear. The highest dilution producing such complete agglutination within thirty to ninety seconds of both emulsions was determined, and in the drops thereof, each containing the agglutinated emulsion, the platinum loopful (two millimetres in diameter) of distilled water, to compensate for evaporation, was added. A similar loopful of the *M. melitensis* emulsion was placed in the agglutinated *V. choleræ* containing drop, and vice versa. On the re-examination made with the three full minutes time limit the *M. melitensis* was agglutinated and the *V. choleræ* not agglutinated; that is to say, *V. choleræ* was incapable of taking out the specific agglutinin for *M. melitensis*, while the *M. melitensis* removed the hetero-agglutinin for *V. choleræ*.

By a similar procedure co-agglutinins formed for *B. dysenteriæ* Flexner-Hiss in *B. dysenteriæ* Shiga infections, or co-agglutinin formed in *B. typhosus* infection (in non-paratyphoid inoculated patients) may be distinguished from specific agglutinins, etc.

[1] Since writing the above I have employed this test during an outbreak of plague with most satisfactory results.

Clinical and other Notes.

LOBAR PNEUMONIA IN A BASE HOSPITAL IN FRANCE.

A Clinical and Pathological Study, with Special Reference to the Fatal Cases.

By Captain ARCHIBALD MALLOCH, C.A.M.C.
and
Major LAWRENCE J. RHEA, C.A.M.C.

Pneumonia is ever old and ever new, and, as it is such a serious disease, it is always worthy of study. We feel that this brief account of seventeen fatal cases out of a total of sixty-five of lobar pneumonia may be of interest, because the type of patient, the conditions under which they were living and working and under which they were treated, were all so different from those met with in ordinary private and hospital practice. We also hope that others may report similar series of cases from war hospitals so that the various aspects of the disease, seen under war conditions, may be fully displayed. All the cases with which we shall deal were of primary disease of the respiratory tract, and were in the hospital between January 1 and the middle of July, 1917. Statistics are always brittle things to handle, and in our small series of cases we do not wish to lay too great stress upon this side of the question. Whilst we have to do primarily with the fatal cases, reference will be made from time to time to those which recovered.

In the matter of treatment of the patients in a base hospital, we are of the opinion that owing to the excellent arrangements as regards food for the Army, to the unlimited supply of blankets, pillows, back-rests, etc., from the Ordnance Department, to the variety of drugs obtainable from the Army Base Medical Stores, and to the extra comforts supplied by the Red Cross, the sick have been at little disadvantage. An abundant supply of fresh eggs and milk has always been to hand.

The patients were concentrated in one hut which forms a part of the "line" under the charge of one of us. Cases of pneumonia, lobar or bronchial, occurring in connexion with wounds of the thorax or other parts of the body, were kept in the surgical wards, and these fall outside the limit of this study. It was deemed advisable to have the cases of pneumonia together in one hut, for several reasons which we shall point out below. Most of the cases diagnosed "pneumonia" and admitted from convoys, had already reached the convalescent stage before being moved down from the Front, and were retained in the medical ward which was receiving for that particular day. But if the patients received from local units or from convoys were in the early or critical stages of the disease, they were seen by Lieut.-Col. John McCrae, officer in charge of Medical Division, and were immediately transferred to the "pneumonia hut." By this arrangement, apart from the economy and division of labour, we have thought that the best interests of the sick have been served. They were thus put into a quiet and restful place, a consideration of the greatest import in the treatment of pneumonia. The

patients were not disturbed during any admissions of convoys, or during evacuations, as would have been the case in a large ward where there is so much coming and going. Nor were they upset by the necessary noise and bustle of an ordinary ward at mealtime, and by the inevitable gramophone. Many of the patients, too, have experienced relief in breathing on being transferred to the hut and on leaving the "Woodbine" atmosphere of a general ward. We have as far as possible in all weathers kept windows and doors open wide, and this would have been impossible in the presence of "up" patients. Indeed, so far have we considered fresh air of importance, that often the patients' beds were moved outside upon the grass beside the hut. In the "pneumonia hut" are about a dozen beds, and we have been allowed more nurses in proportion to the number of patients than is the case in the rest of the hospital, except perhaps in the hut reserved for wounds of the chest. Skilled nurses have thus been enabled to devote their whole time to the small number of patients. We have also been well supplied with orderlies. In the small kitchen under the same roof it has been possible to prepare special diets for the very sick. Although lobar pneumonia is classed in the Army as an infectious disease and broncho-pneumonia is not, we have made it a point of segregating both varieties of cases. The "pneumonia hut" has been under the care of one medical officer, who has had fewer patients to look after in his "line" than those in charge of other wards, and has thus been able to spend more time on those suffering from this disease. One of us (A. M.) who has looked after these patients in the ward has also been present and taken part in the autopsies which were performed by the other (L. J. R.). This we have felt to be a rare opportunity of correlating the symptoms and signs in the course of the disease with the findings at autopsy, of seeing one's mistakes, and of learning the limitations in attempting a diagnosis of certain of the complications.

All the patients admitted to the hospital were soldiers, with one exception, and he was a member of a civilian railway troop. The men had all been passed for active service, and except for a few in certain labour companies, were of remarkably good physique. The majority were between 20 and 40 years of age. Of the seven fatal cases in men of 40 or over, five came from "local" units, and were on active service at the base or on the lines of communication. We found that some of these men in their patriotism and desire to "do their bit," underestimated their age, and thus were taken on for foreign service. What a contrast with ordinary hospital work in a large city! Here on active service we have chosen for us, so to speak, what we should expect to be the most favourable class of patient, both as regards state of health and quality of physique. How many of the cases of pneumonia at home occur in poorly nourished men from the slums, in men who are habitual alcoholics, and in those who are already handicapped at the onset of the illness by some chronic cardio-renal, arterial, or respiratory disease. It is of some interest to note that many peoples from many climes within the British Empire were represented, and in the ward men from the British Isles lay side by side with Australians, New Zealanders, Canadians, and British West Indians. There were 47 British cases admitted and 16 died; 7 Australian or New Zealanders, and none of these died; 5 Canadians, and of these 1 died. We had only five negroes in this series and none of these died, although pneumonia in them seemed to take on a new aspect, characterized by long duration. Other hospitals have had more British West Indians and we

cannot speak confidently at present on pneumonia as seen in them. Our one Maori, aged 23, died on the eighth day. A Fiji Islander was a rather remarkable case of lobar pneumonia, for he had high continued fever of 103° F. or more until the sixteenth day, when recovery by crisis occurred.

Month.—Five cases of lobar pneumonia, which had been admitted in December, 1916, were still in the ward in January, 1917, when our series begins. Seven cases of lobar pneumonia were admitted in the month of January and there were two deaths during this month. February was the heaviest month with 17 admissions and 6 deaths; March, 12 admissions and 3 deaths; April, 10 admissions and 2 deaths; May, 8 admissions and 2 deaths; June, 5 admissions and 2 deaths. During the first half of July there was one admission and no death.

Age.—Eight of our patients were below 20 years of age and none of these died. Between the ages of 20 and 29 there were twenty-six cases with a mortality of five, i.e., 19·2 per cent. Of those aged between 30 and 39, sixteen patients were admitted and five died, a mortality of 31·2 per cent. Fourteen of these cases of lobar pneumonia were from 40 to 49 years of age and six ended fatally, i.e., a mortality of 42·8 per cent. One patient who died was 59 years of age. We had no other cases above 50 years of age. The mortality, in all patients treated, was seventeen in sixty-five, i.e., 26·1 per cent. As we shall point out below, thirteen of these seventeen cases showed bilateral involvement.

Local or Convoy Admissions.—Thirty-eight of our cases were local admissions, and of these nine died, a mortality of 23·6 per cent. The mortality in cases admitted by convoy, i.e., from the Front, was considerably higher, twenty-seven cases with eight deaths, a mortality of 29·6 per cent. When we hold that it is wrong even to allow a patient suffering from pneumonia to exert himself in bed, and when we consider the fatigue which must be caused by a railway journey and ride in an ambulance, then the contrast in the percentages given above is as we should expect.

The convoy patients were admitted with a variety of diagnoses, but those of "pleurisy" or "pleurisy ? pneumonia" were the most frequent. Some were sent to us diagnosed "pneumonia." Other diagnoses were "bronchitis," "P.U.O." (pyrexia of uncertain origin), "D.A.H." (disordered action of the heart), "D.A.H. and P.U.O.," "influenza," "laryngitis," and "debility." All this, we think, goes to show the difficulties, due to rush of work, with which the medical officers at Front area hospitals have to contend. At the same time, we feel that if at the Front there is a strong suspicion that the case is one of pneumonia the patient should not be sent to the base whilst the disease is beginning, is at its height, or is in the early convalescent stage. A grave mistake was made in sending down on the seventh day, with the diagnosis of "pneumonia," a patient whose illness had been characterized at its onset by "pain in the right upper chest, cough, rusty sputum." He was extremely ill on his arrival, and died twenty-four hours after his admission to our hospital.

Field Service.—In contrast with "Total Service" this means service with the Expeditionary Force, and in the fatal cases it varied from one day to two and a half years. Our figures do not show that the percentage of deaths in lobar pneumonia increases with the length of stay of the soldiers in France.

Previous History.—Three of the fatal cases were in-patients who had suffered

from pneumonia before; three confessed that they had been alcoholics; three stated that they had often been troubled with bronchitis and asthma; and two had had malaria. One of these latter had been through the South African War, but did not know that he had contracted the disease there, although his history subsequent to that period warranted us in concluding that he had. Chills and "spikes of fever" made us suspicious during the course of his disease, and the organisms of tertian malaria were found in his blood. This war has abundantly proved that in persons who have suffered from malaria the disease may reappear during an acute illness, after a fracture of one of the bones, or even after slight wounds. Vandenbosche[1] has studied this question at Salonica.

Onset.—The mode of onset in these fatal cases did not differ in any striking way from that which one expects to find in lobar pneumonia. It is a disease which may attack one at any time or in any place, and it is not surprising that amongst our patients there was a soldier who was taken ill whilst on leave in England, and on the point of returning. He reported sick on his arrival in France. Another man had been for about two weeks in one of the medical wards suffering from sore throat, slight cough, headache, general aches and pains, and anorexia. His temperature had been normal or sub-normal when one day he suddenly had a severe chill, and his temperature rose to 103·7° F. He died of a very extensive bilateral lobar pneumonia.

Clinical Course.

Herpes.—There are some who consider that the presence of this lesion warrants a favourable prognosis. In our series such a conclusion cannot be drawn; of the 48 living cases herpes was noted in 8, and in the 17 fatal ones our records show that it occurred 5 times. In one instance herpes did not appear until the seventh, and the patient died on the eighth day of disease.

Temperature.—Ten of the seventeen fatal cases had high continued fever. The others showed marked remissions, and these generally coincident with the spread of the disease to another lobe. The chart of the case complicated by malaria was an interesting one. Chills began on the seventeenth (?) day of disease, and with the first one his temperature rose to 105° F. After quinine had been given for several days the chart was of the septic type. As dullness and blowing breathing persisted, and as the fluoroscope showed a dense shadow, which apparently lay between the middle and upper lobes, interlobar empyema was suspected. The needle and syringe, however, failed to find pus. No heart murmurs were made out. The autopsy showed a band of unresolved pneumonia in the right upper lobe. This area of consolidation occupied the position of the shadow seen in the fluoroscope, and had been interpreted as an interlobar empyema. However, no pus was found, nor was there any fissure at this site, as the middle lobe was absent. There was acute ulcerative endocarditis of the aortic valve. Other "atypical" charts were seen in the two cases operated upon for empyema. In the first, the temperature had gradually fallen from 103° F. to normal on the thirteenth day, but rose on the fourteenth to 103° F. again, and remained between this level and 100° F. until death on the twenty-ninth day. We failed to find pus with the needle on the seventeenth, nineteenth and twenty-

[1] *Journ. de Méd. et de Chir. prat.*, April 25, 1917.

first days; but succeeded in doing so on the twenty-third. A rib was resected on the following day, and the cavity well drained. The patient was transferred to a surgical ward. At the autopsy no "pocketing" of pus was found on the side (right) operated upon, but unresolved pneumonia of the whole of this lung. Whilst there was no pneumonia on the opposite side, we found a large clear pleural effusion which had caused great compression of the lower lobe. The second patient with empyema had had high continued fever with a maximum of 105° F. and a minimum of 100° F. The disease was extensive, there were no chills, and for a time empyema was not thought to be present. The chest was explored with a needle on the fourteenth day, and merely blood from the lung recovered; but on the eighteenth day, on tapping the thorax at a different site on the same side, fifteen ounces of turbid fluid were withdrawn. A smear of this showed pneumococci. A rib was resected on the same day, and a large cavity drained. The patient died on the nineteenth day, and the post-mortem examination showed delayed resolution and some organization of the lung on the same side which had been operated upon. There were 1½ pints of turbid fluid on the opposite side which contained very many pneumococci. Here the left lower lobe was represented by a tiny lappet, and practically the whole lung, except for a small part at the apex, was consolidated. The disease was even more extensive than was thought.

Extent of Disease.—A striking feature of our cases has been the number in which both lungs were affected. Thirteen out of seventeen showed this. It is a higher proportion than we have found in a large series of post-mortems in Canada, and is still being maintained, as the only three autopsies, done upon cases of lobar pneumonia since our present series was closed, have shown the same condition. In 100 post-mortems performed at the Montreal General Hospital, Osler reported only seventeen cases with disease of both lungs. In one of our cases the lesion on the opposite side was not diagnosed during life, and this was in a prolonged case of unresolved pneumonia complicated by malaria and endocarditis as we have referred to above. Here broncho-pneumonia of both lower lobes was found post mortem. In four cases the pneumonia was bilateral on admission to hospital. Extension of the disease to another lobe of the same lung, or to the other lung, was often accompanied by fresh pleuritic pain, the appearance of bright red blood in the sputum, and by signs of consolidation. When an exact date was noted in these cases this spreading of the disease took place generally about the sixth day. In four cases it was found at autopsy that the pneumonia, noted on the opposite side to that of the original lesion, was of confluent lobular, and not lobar, distribution. It is quite commonly observed clinically in cases of lobar pneumonia that the blowing breathing and other signs of consolidation appear in the course of the disease in the contiguous part of the neighbouring lobe. In our series of autopsies we saw five examples of this paradox of lobar pneumonia; that is, sharply defined and firm consolidation, lobar in nature, of only part of a lobe, whilst the remainder was quite free to the naked eye from any disease. A satisfactory explanation of this phenomenon has never yet been given as far as we know. It is possible that infection may take place where the endothelial cells covering contiguous surfaces of the pleura have been injured or destroyed by the pleurisy which is always present. Very often too, as may also be demonstrated during life in an ordinary case of lobar

pneumonia, we found that a narrow margin at the anterior border of the lobe showed no consolidation, so that the pneumonia was not "lobar" in the strict sense of the word.

Delirium.—This was not a troublesome factor with which to contend. It was noted in eight of the seventeen fatal cases, and in only one was it very marked. We have not yet drawn off cerebrospinal fluid to relieve this symptom, as has recently been recommended by Musser and Hafford.[1]

Extra-systoles.—It has often been pointed out that extra-systoles may disappear during the course of an acute disease, accompanied by high fever. We had the opportunity of noting this phenomenon in the case of a man, aged 48, who, when admitted, had marked extra-systoles, but in the course of a few days the heart and pulse became quite regular. Unfortunately we were unable to see the extra-systoles return as the patient died.

Immediate Cause of Death.—Practically all the seventeen cases died with evidence of failure of the right side of the heart, and after death the chambers on this side of the organ were found to be dilated. Only one of the cases died of the toxic effects on the respiratory centre, and contrary to that which was noted at the time of death of all the others, the respirations ceased an appreciable interval of time before the beating of the heart. Before death there had been no cyanosis. The patient was 25 years of age, and died on the fifth day of disease. The post-mortem examination revealed early grey hepatization of all the lobes except the left upper one. There was no dilatation of the heart. By coincidence this picture stood out in sharp contrast with the usual findings, as at the same time we did an autopsy upon the body of a man, aged 48, who died of failure of the heart on the tenth day of disease, and who was markedly cyanotic before death. There was very extensive disease of both lungs in this case, and we estimated that the patient could not have used more than one-seventh or one-eighth of his lungs for breathing. The right side of his heart was greatly dilated, and filled with post-mortem clot.

Duration of Disease.—There is nothing very remarkable to note in the duration of the disease in these fatal cases. However, in 1916, we performed an autopsy on a British West Indian who had died ten hours after a typical onset of lobar pneumonia. He had been engaged in hard manual labour close to the hospital, and was brought in direct. His lungs were a beautiful example of red hepatization. In the series under consideration one died on the fifth day, and one on the sixth day of illness. Four died on the seventh, five on the eighth, and two on the tenth day. Two patients were operated upon for empyema, and these died on the ninteenth and twenty-ninth days respectively. One patient died about the twenty-second day (the date of onset was obscure).

At the autopsy there was found lobar pneumonia of the whole of the left lung with beginning resolution, and also a mass of broncho-pneumonia in the right lower lobe. This patient had had septicæmia, and a mural thrombus was found in the right ventricle, but no signs of infarct in the lung could be made out. And finally, one case died on the twenty-ninth (?) day. This patient had unresolved pneumonia, complicated by malaria and ulcerated endocarditis, as described above.

---

[1] *Journ. Amer. Med. Assoc.*, 1917, lxviii, p. 1231.

COMPLICATIONS.

Diarrhœa.—Not infrequently the patients in the various wards of the hospital have been troubled with diarrhœa, the cause of which has evaded the keen search of the Sanitary Officer. Along with other patients those in the "Pneumonia Hut" were attacked, and the treatment of three of the fatal cases was made more difficult on account of this disorder.

Malaria.—One patient, to whom we have already referred, had malaria.

Empyema.—In the sixty-five cases of lobar pneumonia empyema was diagnosed three times. All these patients were operated upon; one recovered and the other two died. One of these latter had pus in both pleural cavities. These two cases have been dealt with already, when we were describing those fatal cases which had atypical temperature charts. It is satisfactory to note that no patients died with the complication of empyema undiagnosed.

Pericarditis.—This occurred three times, but was diagnosed in one case only, that of a soldier aged 27. On the seventh day of disease, a to-and-fro friction, synchronous with the movements of the heart, was made out. It was heard at the base of the heart, but best in the second intercostal space immediately to the right of the sternum. He died on the eighth day and the pericardial sac contained a recent fibrinous exudate, and a slight increase in the amount of fluid.

Endocarditis.—Acute endocarditis occurred twice in the seventeen fatal cases, but was not diagnosed clinically. One instance has been described already in the patient who had malaria. The lesion was of the ulcerative type, and situated upon the aortic valve. No murmurs had been heard during life, although these were faithfully sought after. The spleen showed two infarcts. The other case showing this complication was in a man, aged 40, who was large and plethoric-looking, and confessed to an alcoholic history. He was admitted on the eighth day of disease, and a loud to-and-fro murmur was heard at the base of the heart, at the root of the neck, and in the epigastrium, but best heard over the second and third right intercostal spaces. He did not have a "water-hammer" pulse. There was no mitral murmur. The murmurs were attributed to old lesions of the aortic valve (probably syphilitic), and although the heart was listened to carefully on several occasions no change in murmur was made out, and no pericardial friction detected. The man died of cardiac failure on the tenth day of disease. His fever had been continuous between 102° and 104°. At the autopsy we found acute fibrinous pericarditis, with a very small amount of exudate and effusion. The right side of the heart was dilated, and the left ventricle hypertrophied. There was extensive destruction of the aortic valve, especially at the base of the cusps, and the recent vegetations were large. The injury to the heart muscle varied in extent, but in the interventricular septum the ulcerative process had extended right through, and a small granular area of necrosis was seen on the inner wall of the right ventricle. Pneumococci were grown from the vegetation. There was the typical "wash-leather" appearance of syphilitic aortitis with aneurismal dilatations, and also sclerosis of the aortic cusps at their bases. Therefore, as is often the case, the acute had been grafted upon a healed endocarditis. Blood was recovered post mortem and the Wassermann test, carried out by our colleague, Captain R. H. Malone, proved positive. In speaking of endocarditis as a complication we must refer to the case with mural thrombus which

has already been described. In the cases which recovered we have not sufficient evidence that any of them suffered from endocarditis.

Jaundice. — Marked generalized jaundice occurred only once, although "icteroid sclerotics" were noted several times. It is not without interest to record, in confirmation with the general finding that this complication is more frequent in the deeply pigmented races, that our case was in a Maori, aged 27. By the fifth day jaundice had become very deep. His temperature remained almost continuously at 104°, and he died on the eighth day of disease. At the post-mortem examination signs of a profound toxæmia were present as evidenced by punctate hæmorrhages beneath the pericardium. The jaundice was quite general, and nothing was seen suggesting obstruction in the bile-ducts or duodenum. The spleen was not enlarged.

Treatment.

The patients were all given fresh air, light nourishing diet, and abundance of fluids. Magnesium sulphate was prescribed every morning unless contra-indicated. Otherwise, the treatment was mainly symptomatic. In the early stages of the disease we did not hesitate to give morphia $\frac{1}{4}$ grain with atropine $\frac{1}{120}$ grain hypodermically to allay pain and induce sleep. Tympanites, always such a troublesome and serious symptom, was treated with turpentine stupes and turpentine enemata, and on rare occasions with turpentine by mouth. As stimulants, strychnine, adrenalin, oil of camphor and digitalin were used, but generally with apparently little effect. When signs and symptoms suggested a possible empyema we always tapped the thoracic cavity, even several times. No apology is made for including this exploratory measure under the heading of Treatment.

NOTES ON A SERIES OF ONE HUNDRED AND SIXTY-ONE CASES OF GUNSHOT WOUNDS OF THE HEAD TREATED AT No. 7 GENERAL HOSPITAL, MAY TO AUGUST, 1916.

By Captains W. W. WAGSTAFFE and W. J. ADIE.
Royal Army Medical Corps.

CONTENTS.

I.—Origin of Cases.
II.—Numbers.
III.—Detailed Consideration of Cases operated on at No. 7 General Hospital.
IV.—Detailed Consideration of Cases operated on before Admission.
V.—Scalp Wounds.
VI.—Conclusions.

Additional Note by Colonel C. Wallace, C.M.G., A.M.S.

As the result of the D.G.M.S.'s permission to treat head wounds arising in the First Army area at No. 7 General Hospital, the D.M.S. First Army, issued instructions to commanding officers of the casualty clearing stations, permitting them to send on such cases by car to No. 7 General Hospital.

The type of case sent on has been that in which operation seemed likely to be of benefit, namely, those cases with slow pulses. They have been of all degrees of severity. Cases with rapid pulses have not, as a rule, been sent back, as such cases usually are not worth submitting to operation.

I have satisfied myself that the cases have stood the journey well, as I have seen them in the casualty clearing stations and on arrival at No. 7 General Hospital.

No. 7 General has also received by barge cases operated on in the same casualty clearing stations that have sent cases back before operation. It has been therefore possible to compare the results obtained by operation at the "Front" and "Base," and as the cases have been practically of the same severity the comparison is a fair one.

In making the comparison it is of course necessary to remember that the cases received by barge are the survivors of the cases operated on at the casualty clearing stations, a certain amount of elimination by death having already taken place. One would therefore expect the mortality of those operated on at No. 7 General to be larger than those received by barge. As a matter of fact it is about two per cent heavier. If, however, the cases dying within two days (head cases are kept, as a rule, much longer than at the casualty clearing stations before transfer) of operation at No. 7 General are taken out, the mortality is much in favour of those transferred before operation, and the difference will cover any error due to the fact that the type of case operated on at the casualty clearing stations might be more severe than those operated on at No. 7 General, owing to the medical officers at the casualty clearing stations giving unfavourable rapid pulse cases the chance of operation interference.

The experiment can, I think, be said to be very successful. It avoids the necessity of transferring such cases at a time when they travel badly, and the beneficial effects of perfect quiet after operation are shown by the absence of secondary complication, as is pointed out by Captains Wagstaffe and Adie. I may point out that I have frequently received reports of head cases arriving at the sea bases in bad condition, which cases have left the casualty clearing stations in "good condition."

It might be said that the experiment shows that head cases might be transferred to the sea bases before operation, but this necessitates considerable delay in clearing up the lines even when trains are running every day, but when in "peace times" the trains evacuate only at two or four days' interval, the delay is too long to be risked.

It seems that it would be worth while establishing in each Army Area some hospital within reasonable distance of the front, to which head cases can be transferred, and where they will have the benefit of X-ray examination, reasonably early operation and complete rest until ready for transference to England. The type of operation is as follows:—

Excision of scalp wounds.
Cutting away bone to show about half an inch of uninjured dura.
No deep search for the projectile.
Covering in the exposed brain by the scalp (wounds one flap external).
A short period of drainage by tubes through the angle of the flap.
The brain has only been drained in exceptional cases.

I.—Origin of Cases.

On May 24, 1916, the first cases of gunshot wounds of the head arrived at No. 7 General Hospital. Since then a total of 161 have been treated. These cases have been derived from the First Army Area and have been brought to No. 7 General Hospital by one of two methods of transport:—

(*a*) *Motor Ambulance.*—These cases are brought direct from the casualty clearing stations without operation. The period of transit from the casualty clearing station here is on an average two hours, and they usually reach here within twenty-four hours of being wounded.

(*b*) *Barge.*—These cases are brought from the casualty clearing stations where they have usually been operated on. The period of transit from the casualty clearing station here is on an average twenty-four hours, and they are moved at a variable period after operation.

In considering the results of the treatment of these cases we shall find it convenient to divide them into two classes: (*a*) not operated on before admission, (*b*) operated on before admission, and to consider certain points which arise in connexion with this essential difference.

II.—Numbers.

The subjoined Table "A" gives a rough analysis of the cases on which this report is based:—

TABLE "A."

(1) Total number of cases of injury to skull:—			
(*a*) Not operated on before admission	100		
(*b*) Operated on before admission	36		
		—	136
(2) Total number of cases of scalp wounds necessitating operation..			25
			161
(3) Total number of cases trephined:—			
(*a*) Operated on at No. 7 General Hospital	89		
(*b*) Operated on before admission	34		
		—	123

III.—Detailed Consideration of Cases not operated on before Admission.

These cases have been of all degrees of severity, and were selected by the casualty clearing stations as being capable of standing the journey of two hours. They have included a large number of cases whose condition was very bad, and while it is difficult in the majority of cases to appreciate the exact condition in which the patients left the clearing stations it can be said that they all, even those most seriously wounded, stood the journey remarkably well and in no single case can it be said that the journey either caused death, or decreased in any way, so far as clinical evidence is capable of showing, their chance of recovery. In no case was a sudden exacerbation of symptoms noted on the journey, and in all cases where the condition on leaving the clearing station was accurately reported, the condition on admission showed no appreciable deterioration. One case died before admission. This man had extensive cerebral and cerebellar laceration.

In considering these cases in detail it will be well to give a table showing the classification of the cases.

TABLE "B."—Gunshot Wounds of Head with Injury to Skull Operated on at No. 7 General Hospital.

(1) Penetrating wound of dura :—		
Total number		73
Discharges from hospital to England		32
Under treatment : (*a*) Satisfactory		7
(*b*) Critical		9
Deaths		25 (34 per cent)
(2) Non-penetrating wound ; skull fractured :—		
Total number		27
Discharges from hospital to England		22
Under treatment : (*a*) Satisfactory		3
(*b*) Critical		0
Deaths		2 (7·4 per cent)
(3) Totals :—		
Total number		100
Deaths		27 (27 per cent)

(*a*) *Deaths.*—In this Table the most striking feature is the large proportion of deaths in the case of Class 1, penetrating wounds of dura. Let us therefore examine these deaths and their causes as shown by the post-mortem examinations :—

TABLE "C."—Deaths of Cases Operated on at No. 7 General Hospital—Penetrating Wounds of Dura.

Serial No.	Name	Death days after wound	Cause of death
6	W.	1	Cerebral and cerebellar laceration
1	H.	1	Cerebral œdema
74	S.	1	Brain laceration ; hæmorrhage third ventricle
91	B.	1	Cerebral and cerebellar laceration, lateral ventricle involved
99	F.	1	Cerebral laceration, lateral ventricle involved
134	C.	1	,, ,, ,, ,, ,,
167	P.	1	,, ,, ,, ,, ,,
179	McD.	1	,, ,, ,, ,, ,,
30	P.	2	,, ,, ,, ,, ,,
43	D.	2	,, ,, ,, ,, ,,
53	S.	2	,, ,, ,, ,, ,,
73	C.	2	Right lateral ventricle involved
132	H.	2	Cerebral laceration, lateral ventricle involved
146	W.	4	Hæmorrhage, subdural, in posterior fossa and spinal cord
18	C.	5	Brain laceration, purulent basal meningitis
10	R.	6	Brain laceration, pneumonia
99	B.	7	Cerebral laceration, lateral ventricle involved
133	S.	10	Purulent basal meningitis
119	L.	11	Cerebral laceration, lateral ventricle involved
90	B.	12	Purulent basal meningitis
106	S.	12	Cerebral laceration, lateral ventricle involved
107	L.	12	,, ,, ,, ,, ,,
83	P.	17	Lateral ventricle involved, cortical meningitis
93	C.	21	Lateral ventricle involved, purulent basal meningitis
82	S.	22	Cerebral laceration, lateral ventricle involved

From this Table we see that a large proportion of the deaths, thirteen out of twenty-five, occurred within forty-eight hours of the time of wounding, and in nearly all of these cases the cause of death was involvement of the lateral

ventricle, accompanied by laceration of the brain. At the post-mortem examination of these cases the ependyma of the lateral ventricle is found to be pierced, and the lateral ventricle cavity and often the other ventricles as well contain lacerated brain matter and blood. This condition appears to be almost uniformly fatal within a comparatively short time. We may take it then that these cases if they had been operated on at a casualty clearing station could never have been transferred down the line, and we may for purposes of comparison with the cases operated on and transferred here, omit these cases in the consideration of our mortality percentage. Table "B" can therefore be modified.

TABLE "D."—Gunshot Wounds of Head with Injury to Skull Operated on at No. 7 General Hospital.

(1) Penetrating wound of dura (eliminating deaths within forty-eight hours of arrival) :—		
Total number	60	
Deaths	12	(20 per cent)
(2) Non-penetrating wound; skull fractured :—		
Total number	27	
Deaths	2	(7·4 per cent)
(3) Totals :—		
Total number	87	
Deaths	14	(16 per cent)

As regards the cause of death in those dying in hospital more than forty-eight hours after being admitted, there are certain points of interest.

(1) Cases dying of purulent basal meningitis. Four in number, thirty-three per cent of deaths. We shall see later how this compares with the figures of cases operated on before admission.

(2) Cases dying of cerebral laceration with involvement of the lateral ventricle. In these cases the involvement of the ventricle appears not to have occurred at the time of the injury but later, as a result of changes in the cerebral tissues, and to be as a rule the determining cause of death. In all of them there was a complete absence of basal meningitis.

(*b*) *Recovery.*—In speaking of recovery with reference to these cases, the term is, of course, used in a comparative sense, as the time during which they are under observation is far too small to enable one to form as yet any definite opinion as to the ultimate prognosis. Generally speaking the patients are kept in the hospital until they are able to get up in a chair, a period averaging about six weeks. It is assumed that a patient who can with impunity get up in the ward, will equally with impunity bear the journey to England.

The recovery in the great majority of the cases has been uninterrupted by fits or any sudden exacerbation of symptoms, as the following table will show :—

TABLE "E."—Recoveries of Gunshot Wounds of Head Penetrating. Operated on at No. 7 General Hospital.

Number of cases discharged to England	32	
Uninterrupted progress	28	(87 per cent)
Complications	4	
Fits (general)	1	
Headache and pyrexia	2	
Erysipelas	1	

(*c*) *Operation, Technique, Treatment.*—On admission to the hospital the patient has an X-ray taken of his skull, antero-posterior and lateral views, and he

is then sent to the ward. After a rest of from four to twenty-four hours he is operated on. The operation usually performed is of the most conservative type, and consists, in the case of penetrating wounds of the dura, of an excision of the wound, turning down a flap, removing the bone so as to give a margin of at least ¼ inch of healthy dura around the perforation, suturing the excised wound and closing the flap with lateral drainage. In some cases of extensive injury of the brain a drainage tube has been inserted through the excised wound into the brain.

The operation is performed under a general anæsthetic with an injection of morphia, atropine and scopolamine previously. The anæsthetic is in nearly all cases very well taken, and a very small amount is required.

The after treatment consists in maintaining the patients in a condition of perfect quiet. Restlessness is a very common feature and is combated with injections of morphia and atropine. In no case in our experience has the patient proved noisy and refractory to this treatment, and a small ward set apart for the segregation of noisy and refractory patients has only had to be used very rarely, and then only for patients with meningitis in the terminal stages.

The healing of the wounds has been remarkable, and only one case has been discharged to England with a large granulating surface. This patient had a very large hernia cerebri which subsided under repeated lumbar puncture and became well covered with healthy granulation tissue. On discharge there had been no protrusion of the hernia for more than a fortnight.

Urotropine, ten grains four times a day, is administered in all cases of penetrating wound of the dura mater until the temperature has become normal and the patient has ceased to show signs of cerebral injury.

IV.—Detailed Consideration of Cases operated on before Admission.

These cases have been of all degrees of severity, and the extent of the wound has on the average been certainly no worse than in the case of the cases admitted direct without operation.

The following Table gives the numbers of cases received :—

TABLE "F."—Gunshot Wounds of Head with Injury to Skull. Operated on before Admission to No. 7 General Hospital.

(1) Perforating wounds of dura :—			
Total number		32	
Discharged from hospital to England		18	
Under treatment : (*a*) Satisfactory		1	
(*b*) Critical		3	
Deaths		10	(32·3 per cent)
(2) Non-penetrating wound ; skull fractured :—			
Total number		5	
Discharged from hospital to England		4	
Under treatment : (*a*) Satisfactory		0	
(*b*) Critical		0	
Deaths		1	
(3) Totals :—			
Total number		36	
Deaths		11	(30·5 per cent)

(*a*) *Transport.*—The first problem that presented itself was to investigate how far the patients who are moved soon after operation have their chances of recovery diminished in comparison with those who are moved later. The following Table shows the results on this question :—

TABLE "G."—General Analysis of Cases operated on before Admission to No. 7 General Hospital.

Transferred on days after operation	Number of cases	Died	Recovered: Developed symptoms after admission	Recovered: Developed no symptoms
2nd	4	2	2	—
3rd	1	—	—	1
4th	2	2	—	—
5th	6	—	4	2
6th	3	2	1	—
7th	3	—	3	—
8th	5	1	2	2
9th	2	1	1	—
12th	2	—	—	2
14th	1	—	1	—
15th	1	1	—	—
	30	9	14	7
	1 date unknown	1 date unknown		

No general conclusion is possible from such a small number of figures, but it may be stated generally that those who are moved earliest are worst on arrival.

(*b*) *Deaths.*—The following Table gives an analysis of the causes of death in the case of penetrating head wounds operated on at the casualty clearing stations:—

TABLE "H."—Deaths of Cases of Penetrating Head Wounds operated on before Admission to No. 7 General Hospital.

Serial No.	Name	Moved days after operation	Died days after operation	Cause of death
79	B.	2	8	Hæmorrhage from lateral sinus
111	C.	2	6	Purulent basal meningitis
42	H.	4	11	,, ,, ,,
101	H.	4	17	Right lateral ventricle involved
26	S.	6	15	Purulent basal meningitis
136	B.	6	19	Cerebral laceration, lateral ventricle involved, meningitis slight
84	F.	8	21	Purulent basal meningitis
100	F.	9	20	? (P.M. not done).
170	M.	15	16	Secondary hæmorrhage
73	O.	?	12 days after admission	Purulent basal meningitis

In this Table the proportion of cases dying of purulent basal meningitis is remarkable—five out of ten—and also it is worthy of note that there is only one case which died of cerebral laceration and involvement of ventricles, with a slight degree of meningitis. This result one must correlate with the effect of the transporting of the patient after operation. The jolting tends to break down the fine adhesions around the wound and the infection tends to gravitate towards the base, whereas in cases where this transporting is not necessary, the infection which is naturally invariably present tends to remain more localized and can be correspondingly more easily dealt with.

(*c*) *Recovery.*—As has been seen in Table "G," the proportion of cases developing symptoms while in the hospital is very high. The following Table shows the character of symptoms developed:—

TABLE "I."—Recovery of Gunshot Wounds of Head, Penetrating, operated on before Admission to No. 7 General Hospital.

Number of cases discharged to England	18	
Uninterrupted recoveries	7	(39 per cent)
Complications	11	
Fits (general)	3	
Fits (local)	2	
Headache and pyrexia	2	
Headache and pyrexia and swelling of brain	3	
Vomiting		

The responsibility for the high proportion of complications must here rest with the transport, and illustrates well the deleterious effect of transport after operation.

V.—Scalp Wounds.

A small number of lacerated scalp wounds have been admitted to the hospital. They were all treated in the same way by excision of wound and suture. If it was impossible to approximate the edges of the wound completely a drainage tube was inserted. Healing was uniformly good, but in two cases suppuration occurred. The healing of all the cases in which a drainage tube was inserted was satisfactory.

TABLE "J."—Scalp Wounds.

(1) *Operated on at No. 7 General Hospital:—*	
Total number	18
Healed by first intention	13
Satisfactory	4
Suppurated	1
(2) *Operated on before admission to No. 7 General Hospital:—*	
Total number	7
Healed by first intention	4
Satisfactory	2
Suppurated	1
(3) *Totals:—*	
Total number	25
Healed by first intention	17
Satisfactory	6
Suppurated	2

In the case of the patients whose wounds suppurated, the suppuration in each case was moderate in degree, and healing was complete in fourteen days. The incisions in nearly all cases were wide, and involved the removal of a large amount of tissue. The saving of time in convalescence was great, but the occurrence of suppuration points to this method being dangerous unless the patient can be kept under observation during the healing of the wound.

VI.—Conclusions.

It will assist us in coming to some conclusion as to the necessity or otherwise of avoiding transport of patients after operations for gunshot wounds of the skull, if we examine a Table which contrasts the results obtained in cases which have not been moved with those which have been moved.

TABLE "K."—RESULTS TABULATED.

GUNSHOT WOUNDS WITH INJURY TO SKULL.

	Cases operated on at No. 7 General Hospital	Cases operated on before admission
Wounds involving Penetration of Dura :—		
Total	75	31
Percentage mortality, total	34 per cent	
Percentage mortality not immediate	20 ,,	32·5 per cent
Recovery uninterrupted	87 ,,	39 ,,
Non-penetrating Wounds; Skull Fractured :—		
Total	27	5
Percentage mortality	7·4 per cent	1 case died
Total :—		
Total number	100	36
Percentage mortality not immediate	17·4 per cent	30·5 per cent
Percentage mortality, total	27 ,,	—

Any conclusions that one may attempt to draw must at best be tentative. The following points may, however, be emphasized :—

(*a*) There is a great advantage in being able to keep patients in one place after operation without the necessity for subjecting them to the serious vibration involved in a journey.

(*b*) Before operation patients stand transport very well, even very seriously wounded cases.

(*c*) The nursing of head cases demands a large number of highly trained attendants.

(*d*) Before operation every case of gunshot wound of the head should be X-rayed.

(*e*) Recovery of function in paralyses, the result of gunshot wounds of the head, is most remarkable.

(*f*) Retention of foreign body in the brain is not immediately and necessarily hurtful. Twenty-three cases of this class have already gone to England from this hospital.

A NOTE ON THE VALUE OF BRILLIANT GREEN AS AN ANTISEPTIC.

BY CAPTAIN C. H. S. WEBB.
Royal Army Medical Corps.

THE comparative novelty of the use of brilliant green as an antiseptic for the dressing of wounds is the excuse I submit for the following notes.

Since May, 1916, I have been using, and observing the effects of, a solution of brilliant green in the treatment of wounds that have passed through my hands at a casualty clearing station.

On the whole I am favourably impressed with the good results obtained from its use.

The brilliant green is dissolved in normal saline solution in the strength of 1 in 1,000. At this strength it can be used as a lotion, and gauze soaked in it can be applied to the wound as a dressing. It is non-irritant to the tissues and

I have applied it to the peritoneum, the meninges, the synovial membranes and practically all other varieties of tissue without harmful effects.

Unlike antiseptics such as perchloride of mercury, it acts as efficiently in the presence of serum as in its absence.

The less vascular tissues are stained green by its use—for instance, the cuticle of the skin, the edges of fascia or aponeurosis, and sometimes bone. But where it has been in contact with the more vascular muscle or subcutaneous tissue, no staining occurs. Dead and necrosed portions of muscle are stained green, and this fact is sometimes of use in distinguishing such necrotic tissue.

After being in contact with the tissue, the dye gradually becomes transformed into a leuco-derivative, and the hitherto green-dyed gauze in contact with the wound becomes white to the depth of several layers.

Granulation tissue rapidly forms in the wound, and to emphasize this statement, I believe that the formation of granulation tissue is more rapid, and more "virile" in character, under the influence of a dressing of brilliant green than with other antiseptics, e.g., eusol.

The most striking results are seen in the cut surfaces of muscle. The muscle rapidly becomes bright red, and the formation of a highly vascular granulation tissue takes place. In thirty-six to forty-eight hours the muscle may be covered with firm "dry" bright red granulation points, which present none of the shreddy, sodden look of the granulations under a eusol dressing.

The surface of the wound is drier, and the pus formation is smaller in amount and thicker in consistency, than in a similar wound dressed with eusol.

At a casualty clearing station it is almost impossible to formulate other than approximate conclusions concerning the merits or demerits of any antiseptic.

The obstacles against obtaining any exact judgment are as follows :—

(1) The cases have been handled before, and other antiseptics have been applied, i.e., at the field ambulance.

(2) The cases do not stay long enough for any extended observation, before being transferred to the base.

(3) Those cases that do stay and on which more lengthy observations can be carried out, are of the more severe type, many having mortal wounds.

(4) The difficulty of obtaining news of the subsequent history of the case after it has left the casualty clearing station.

However, by a method of comparison of selected cases, as nearly as possible similar in nature and extent of injury, it is possible to estimate the relative merits of two or more antiseptics, as judged by clinical standards.

By such means, I have tried to compare brilliant green with eusol and believe that the green is the better antiseptic of the two.

Latterly I have been using the green in conjunction with "salt" tablets.

It has been my experience that the usefulness of the "saline pack" is enhanced by the inclusion of some antiseptic in the dressing. The combination of the "saline pack" with the green solution during the first few days of the wound has, I think, given better results than the use of one or other alone.

It can also be used after the method of Carrel ʒss to ʒj of a 1 in 1,000 solution being syringed down a tube or series of tubes leading into the depths of the wound.

It is not so irritant to the skin edges as the hypochlorite solution.

Summary.

(1) Brilliant green is undoubtedly an active and efficient antiseptic.

(2) It is non-irritant.

(3) It acts well in the presence of serum.

(4) It possesses very definite auxetic properties.

(5) It stains dead tissue green and in this way may aid the surgeon in determining what to excise.

(6) As it is soluble in "saline" it can be used in conjunction with the "salt pack."

(7) It can be used after the method of Carrel.

NOTES ON AN OUTBREAK OF PHLEBOTOMUS FEVER.

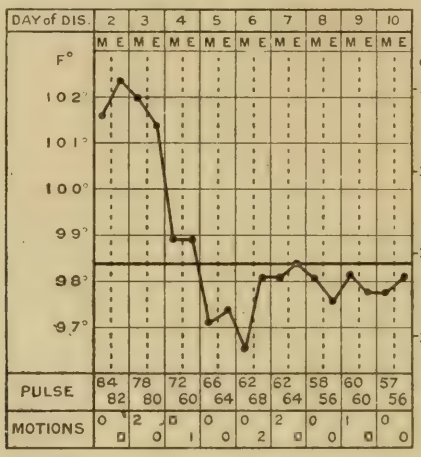
By Captain J. A. HARTLEY.
Royal Army Medical Corps (T.F.).

An outbreak of the above-mentioned fever, which is sometimes referred to as sandfly fever, occurred with a squadron of Yeomanry on outpost duty in mid-Egypt in the middle of summer last year. The post was on the western edge of the cultivation, and the writer was in medical charge of the unit. Of the total strength, 86·4 per cent were infected. The first case was discovered on the thirty-seventh day in occupation and from this there were three or four fresh cases daily for a week, and an average of six daily in the second week. For medical reasons the unit then moved about 1½ miles to a new camp on fresh ground, and although it was impossible to avoid carrying the infection, better conditions followed. For military reasons it was desirable to maintain occupation of the first position and after taking preventive measures, additional to what had already been followed, a guard drawn from another unit was placed in it. Four days had scarcely elapsed, when the N.C.O.s and men who formed this presented symptoms of infection and the illness spread through all of them.

The accommodation consisted of a dwelling house and offices which the officers and N.C.O.s occupied, and shelters constructed of wood and canvas for the men. All were placed compactly on an elevated site adjacent to a pool. This pool covered an area of about an acre and contained more or less stagnant water. Agricultural drains of muddy water were in touch. For all that the sanitary arrangements were satisfactory except for the drinking water which was bad. The latrines and horse lines were at a reasonable distance. Preventive measures were followed in the form of cresol spraying throughout, and the use of paraffin oil on breeding places. Everyone, officers and other ranks, had a mosquito net but this could not be counted on for much, as the midge is so small it can easily pass through the mesh.

The incubation period runs from four to seven days. The onset was very sudden and accompanied with severe malaise, headache, suffusion about the eyes and post-orbital pain; pain in the lumbar region which was generally intense; pains and cramp in the limbs. Constipation nearly always. Profuse sweating. The temperature rose quickly to 102·5° F. or 103° F. As high as 105° F. was noted on a few occasions. After twenty-four hours the pyrexia diminished. It is a "three days fever" and at the end of that period falls to normal. The pulse was not correspondingly acclerated, seldom above 80. It became soft and weak and the cardiac condition required attention.

The suddenness of the onset was the marked feature. A man to all appearance in normal health was at duty at 9 a.m. and an hour later reported ill with giddiness and inability to carry on. His temperature was taken and found to be 103° F.; other symptoms developed in the course of an hour or two. One night another was found on horseback wandering up and down the road unable to recall to mind the way he was accustomed to take to reach camp. He was feeling dazed and ill. His temperature was at the moment taken and found to be 103·2 F. An hour earlier, feeling all right, he had left headquarters of the regiment two miles back from where he was found.



Clinical chart of a case of phlebotomus fever.

In the commencement of the outbreak difficulty was met with in determining what the illness was due to. Phlebotomus fever had not been prevalent nor were contacts from outside found. One or two subjects of malaria were on the strength, many cases of minor septic conditions which might or might not be causing pyrexia, and illness from exposure to heat of the sun had to be taken into account. From dengue the condition is differentiated by the suffused eyes, absence of both rash and the secondary rise in temperature after a few days running normal. In paratyphoid the pyrexia seldom runs so high and has not the characteristic third day drop to normal. Severity of the rigor in malaria and fall of the temperature in a matter of hours distinguish it; enlargement of the spleen is also to be remembered. In influenza implication of the respiratory system is the most frequent accompaniment.

The sandflies were plentiful. They are very small and midge-like, with hairy bodies. Found on walls and in rubble. The breeding places require moisture. The virus is not known.

With regard to incidence, the first to contract the illness were the men, N.C.O.s next and officers last.

Most cases were evacuated to hospital. Those remaining in the lines were kept together apart from the uninfected; had the bowels set working by a purgative and given salicylate of soda, phenacetin or opium for the relief of their pyrexia and aching limbs. Subsequent debility was a marked feature considering the shortness of the acute stage, but many managed to recover sufficiently to return to light duty after fourteen days.

Report.

AN INVESTIGATION INTO THE INCIDENCE OF ALBUMINURIA AND CASTS IN BRITISH SOLDIERS DURING TRAINING AND THE RELATIONSHIP OF THIS CONDITION TO WAR NEPHRITIS

By Captain H. MacLEAN.
Royal Army Medical Corps.

Report to the Committee on War Nephritis.

(The Medical Research Committee provided the services of Captain H. MacLean.)

(*Continued from p.* 255.)

Distribution of Casts in the Different Grades of Albuminuria.

As might be expected, the percentage of albuminuric urines containing casts was highest in those cases where the albuminuria was well marked. Thus, in the 50,000 cases, the percentage of albuminous urines of grades A, B, C, D, containing casts was 44·6, while of grades N, NN, only 20·3 per cent had casts.

Figures for the different groups of 10,000 are given below.

TABLE IX.—Percentage of Albuminuric Cases showing Casts in Different Grades of Albuminuria.

1st	10,000	..	..	Grades A, B, C, D,	50	per cent	..	Grades N, NN,	17·1	per cent	
2nd	,,	..	..	,,	,,	50·1	,,	..	,,	,,	15·7	,,
3rd	,,	..	..	,,	,,	37·0	,,	..	,,	,,	22·6	,,
4th	,,	..	..	,,	,,	46·4	,,	..	,,	,,	24·0	,,
5th	,,	..	..	,,	,,	39·5	,,	..	,,	,,	22·5	,,

The following Tables (X to XIV) show the number of casts observed in the five different groups of 10,000 men examined. The incidence of epithelial and of hyaline varieties of casts associated with the different grades of albuminuria is indicated. In general, the various figures in the different groups agree fairly well.

TABLE X.—Distribution of Casts in First Group of 10,000 Men Examined.

Grade of albuminuria	Number of cases with epithelial casts	Number of cases with hyaline casts only	Total number of men with casts	Percentage of cases with epithelial casts	Percentage of cases with hyaline casts	Percentage of albuminuric cases showing epithelial casts	Percentage of albuminuric cases showing hyaline casts	Percentage of albuminuric cases showing casts of all kinds
A ..	13	6	12	0·13	0·06	54·2	25·0	79·2
B ..	14	12	26	0·14	0·12	31·1	26·6	57·7
C ..	8	10	18	0·08	0·10	22·2	27·7	49·9
D ..	14	13	27	0·14	0·13	18·6	17·3	35·9
N ..	14	24	38	0·14	0·24	7·5	12·9	20·4
NN ..	12	20	32	0·12	0·20	5·3	8·9	14·2

TABLE XI.—Distribution of Casts in Second Group of 10,000 Men Examined.

Grade of albuminuria	Number of cases with epithelial casts	Number of cases with hyaline casts only	Total number of men with casts	Percentage of cases with epithelial casts	Percentage of cases with hyaline casts	Percentage of albuminuric cases showing epithelial casts	Percentage of albuminuric cases showing hyaline casts	Percentage of albuminuric cases showing casts of all kinds
A ..	3	3	6	0·03	0·03	37·5	37·5	75·0
B ..	15	3	18	0·15	0·03	51·7	10·3	62·0
C ..	9	3	12	0·09	0·03	33·3	11·1	44·4
D ..	22	19	41	0·22	0·19	19·4	16·8	36·2
N ..	17	19	36	0·17	0·19	8·8	9·9	18·7
NN ..	22	22	39	0·22	0·17	7·7	6·0	13·7

TABLE XII.—Distribution of Casts in Third Group of 10,000 Men Examined.

Grade of albuminuria	Number of cases with epithelial casts	Number of cases with hyaline casts only	Total number of men with casts	Percentage of cases with epithelial casts	Percentage of cases with hyaline casts	Percentage of albuminuric cases showing epithelial casts	Percentage of albuminuric cases showing hyaline casts	Percentage of albuminuric cases showing casts of all kinds
A ..	3	2	5	0·03	0·02	37·5	25·0	62·5
B ..	13	2	15	0·13	0·02	52·0	8·0	60·0
C ..	8	11	19	0·08	0·11	36·1	30·5	66·6
D ..	35	38	73	0·35	0·38	15·0	16·3	31·3
N ..	25	31	56	0·25	0·31	11·7	14·5	26·2
NN ..	16	17	33	0·16	0·17	8·9	9·4	18·3

TABLE XIII.—Distribution of Casts in Fourth Group of 10,000 Men Examined.

Grade of albuminuria	Number of cases with epithelial casts	Number of cases with hyaline casts only	Total number of men with casts	Percentage of cases with epithelial casts	Percentage of cases with hyaline casts	Percentage of albuminuric cases showing epithelial casts	Percentage of albuminuric cases showing hyaline casts	Percentage of albuminuric cases showing casts of all kinds
A ..	1	—	1	0·01	—	50·0	—	50·0
B ..	12	6	18	0·12	0·06	44·4	23·4	67·8
C ..	12	7	19	0·12	0·07	34·3	20·0	54·3
D ..	37	54	91	0·37	0·54	17·7	25·2	42·9
N ..	18	34	52	0·18	0·34	9·3	17·6	26·9
NN ..	10	22	32	0·10	0·22	6·4	14·1	20·5

TABLE XIV.—Distribution of Casts in Fifth Group of 10,000 Men Examined.

Grade of albuminuria	Number of cases with epithelial casts	Number of cases with hyaline casts only	Total number of men with casts	Percentage of cases with epithelial casts	Percentage of cases with hyaline casts	Percentage of albuminuric cases showing epithelial casts	Percentage of albuminuric cases showing hyaline casts	Percentage of albuminuric cases showing casts of all kinds
A ..	3	1	4	0·03	0·01	50·0	16·6	66·6
B ..	6	7	13	0·06	0·07	22·2	25·9	48·1
C ..	9	13	22	0·09	0·13	17·3	25·0	42·3
D ..	27	68	95	0·27	0·68	10·6	26·7	37·3
N ..	11	34	45	0·11	0·34	5·6	17·3	22·9
NN ..	9	22	31	0·09	0·22	6·1	15·5	21·6

Some Observations on the Amount and Probable Significance of Casts found in Urines.

In certain of the specimens containing casts only very few casts were actually found. Thus, in the case of the epithelial variety, only one or perhaps two were identified in certain urines, while it was fairly common to have urines showing only two or three hyaline casts. As already stated, the significance of the presence of a very small number of hyaline casts is obscure, and the truth probably is that such findings may in certain cases denote definite pathological changes in the kidneys; in other cases they are of little significance. On the other hand, a urine containing albumin, together with epithelial casts in moderate or large numbers, must be regarded with suspicion, and almost certainly denotes, in the great majority of cases, that the renal tissue is the seat of some inflammatory condition which may be progressive in nature and may ultimately lead to well-defined renal disease.

From this point of view it was of interest to ascertain the number of cases in the 50,000 men examined which gave urines showing albuminuria and large numbers of casts. Naturally, the figures obtained are liable to considerable variation, since the personal factor plays a great part in estimating what is to be considered as "large numbers" of casts. Probably the best method would be to count the casts in a given number of fields of the microscope, having previously taken the necessary precautions for ensuring approximately accurate results. This, unfortunately, was impossible in the present investigation, as the necessary time could not be afforded. An attempt, however, is made in the following tables to indicate as nearly as possible the number of men whose albuminous urines contained casts in sufficient numbers to arouse suspicion. In cases where many hyaline casts were found accompanied by only one or two epithelial, the casts are classified as "hyaline." Epithelial and hyaline casts are estimated separately, and the results found in the different groups of 10,000 men are given. (Tables XVI to XX.)

TABLE XV.—Number of Men in 50,000 Examined whose Albuminous Urines contained Large Numbers of Epithelial or Hyaline Casts.

Epithelial casts in large amount	Hyaline casts in large amount	Total with epithelial and hyaline casts in large amount	Percentage with epithelial casts in large amount	Percentage with hyaline casts in large amount	Total percentage with casts in large amount
271	279	550	0·54	0·56	1·10

General Results.

From Table XV it appears that the total number of men who had albuminuria together with moderate or often large numbers of epithelial or hyaline casts were 550. Of these, 271 had epithelial casts, while in 279 cases the casts were chiefly of the hyaline or hyalo-granular variety. If the results of the examination of the urine for albumin and casts have any significance, it appears certain that the minimum number of men suffering from definite renal deficiency in the 50,000 cases examined was 550. From this it is probable that the "Active Service"

part of the Army contains, during training, at least 1·1 per cent of men whose kidneys are inefficient and who are suffering from some degree of disease more or less marked.

Tables (XVI to XX) showing Number of Albuminuric Urines containing Large Numbers of Epithelial Casts or Hyaline Casts in Different Grades of Albuminuria.

TABLE XVI.—First Group of 10,000 Men.

Grade of albuminuria	Number of men with epithelial casts in large numbers	Percentage of total men in group with epithelial casts in large numbers	Number of men with hyaline casts in large numbers	Percentage of total men in group with hyaline casts in large numbers
A	13	0·13	4	0·04
B	14	0·14	8	0·08
C	5	0·05	6	0·06
D	10	0·10	8	0·08
N	11	0·11	10	0·10
NN	8	0·08	9	0·09
Total ..	61	0·61	45	0·45

TABLE XVII.—Second Group of 10,000 Men.

Grade of albuminuria	Number of men with epithelial casts in large numbers	Percentage of total men in group with epithelial casts in large numbers	Number of men with hyaline casts in large numbers	Percentage of total men in group with hyaline casts in large numbers
A	3	0·03	4	0·04
B	10	0·10	2	0·02
C	9	0 09	2	0·02
D	15	0·15	6	0·06
N	8	0·08	10	0·10
NN	15	0·15	7	0 07
Total ..	60	0·60	31	0·31

TABLE XVIII.—Third Group of 10,000 Men.

Grade of albuminuria	Number of men with epithelial casts in large numbers	Percentage of total men in group with epithelial casts in large numbers	Number of men with hyaline casts in large numbers	Percentage of total men in group with hyaline casts in large numbers
A	2	0·02	2	0·02
B	9	0·09	6	0·06
C	7	0·07	8	0·08
D	18	0·18	17	0·17
N	15	0·15	10	0·10
NN	11	0·11	11	0·11
Total ..	62	0·62	54	0·54

TABLE XIX.—Fourth Group of 10,000 Men.

Grade of albuminuria	Number of men with epithelial casts in large numbers	Percentage of total men in group with epithelial casts in large numbers	Number of men with hyaline casts in large numbers	Percentage of total men in group with hyaline casts in large numbers
A	1	0·01	1	0·01
B	8	0·08	7	0·07
C	8	0·08	7	0·07
D	22	0·22	34	0·34
N	10	0·10	15	0·16
NN	12	0·12	8	0·08
Total ..	61	0·61	73	0·73

TABLE XX.—Fifth Group of 10,000 Men.

Grade of albuminuria	Number of men with epithelial casts in large numbers	Percentage of total men in group with epithelial casts in large numbers	Number of men with hyaline casts in large numbers	Percentage of total men in group with hyaline casts in large numbers
A	1	0·01	2	0·02
B	4	0·04	5	0·05
C	5	0·05	8	0·08
D	10	0·10	39	0·39
N	3	0·03	10	0·10
NN	4	0·04	12	0·12
Total ..	27	0·27	76	0·76

Since the total number of men suffering from albuminuria accompanied by casts was 936, this number indicates the maximum number of men who gave any indication of kidney disease as the result of examination of the urine. No doubt many of the urines containing only a few hyaline casts were healthy specimens; but, on the other hand, it is exceedingly probable that certain urines containing a few casts were found negative on examination, as it is not always easy to find casts unless they are present in moderate numbers, when there is, of course, little chance of overlooking them. Since, in some of the cases in which casts were apparently absent, the kidneys were probably not quite normal, one may provisionally accept the view that the specimens of urine containing small numbers of hyaline casts, which were not the result of kidney disease, were balanced by the urines from defective kidneys in which no casts were found.

That the renal tissue may be defective and the urine practically free from casts is proved by the fact that cases of acute nephritis may, on convalescence, show neither albumin nor casts, and yet the kidney efficiency as indicated by the diastatic reaction may be very low.

Taking all these points into consideration, we arrive at the conclusion that at least 1·1 per cent of men on active service are probably suffering from some degree of more or less chronic renal disease, while the maximum number giving any indication of renal deficiency by the ordinary examination is 1·88 per cent.

In round numbers it is possible to state with certainty that not more than two per cent of men give any definite indication of kidney disease, if we allow that kidney disease in general is associated with the presence of albumin and casts in the urine. Fairly definite signs of disease are found in about one per cent of men.

As practically all the men examined had a minimum of four months' training, and the great majority of them had over twelve months, it would appear that the presence of albumin and casts in the urine is no indication that the individual is incapable of severe and prolonged exertion.

(4) The Effect of Sudden Severe Exertion in the Production of Temporary Albuminuria.

It is well recognized that severe exertion, especially when somewhat prolonged, may be followed by the temporary presence of protein in the urine. This albuminuria, however, soon disappears on resting, and, as shown by the observations already discussed in this paper, does not tend to become permanent even after many months of fairly severe muscular exertion.

Only one experiment bearing on this point was carried out in this investigation. A group of 200 men were examined in the usual way after getting up in the morning and again immediately after returning from a course of training which entailed very severe exertion lasting for some hours.

The results bear out the well-known fact that albuminuria may be greatly increased under such circumstances. In this experiment the incidence of total albuminuria rose from 7 per cent in the morning to 14 per cent at night; well-marked albuminuria (A, B, C, D grades) was 2·5 per cent in the morning and 6·5 per cent at night, while the incidence of casts increased from 3 per cent to 6 per cent.

Exact details of the albuminuria are given in the accompanying table:—

TABLE XXI.

Morning. *Results from 200 Men.*		Evening. *Results from same 200 Men.*	
Grade of albuminuria	Number of men	Grade of albuminuria	Number of men
B	1	A	1
C	1	B	6
D	3	C	3
N	3	D	3
NN	6	N	11
	—	NN	4
Total	14		—
		Total	28

(5) Incidence of Albuminuria and of Casts in Men of Different Occupations.

In endeavouring to ascertain whether or not any relationship exists between occupation and presence of albumin, many difficulties were encountered. A great number of the men examined had changed their civil occupations recently, and had been engaged, immediately before joining up, on some work directly connected with the War, which, in many cases, had probably little in common with their former occupation.

Again, in order to get reliable results, larger numbers of men than those examined in the present investigation would have to be taken, for the occupations are so diverse that enormous total numbers would be required in order to give a number in each occupation sufficiently large for statistical purposes.

As the problem is one which has no immediate bearing from the military point of view, only one group of 10,000 men was investigated. The comparatively small

number taken was in part due to the enormous labour involved in classifying the different occupations and ascertaining the number of men in each.

As far as possible, the occupations were divided into two groups—those of a more or less sedentary nature and those entailing active physical exertion and often considerable exposure. Such a division is necessarily somewhat artificial, and gives only rough indications, but it does serve in some measure to answer the question whether or not exposure and hard physical labour are detrimental to the kidney.

The results for albuminuria and for casts are given in percentages of the total number of men engaged in each occupation, but it is quite well recognized that the numbers on which these percentages are based are much too small to have any comparative statistical value.

Since it was quite impossible to give all the various occupations mentioned in the group of 10,000 men investigated, the principal ones alone were taken. These were chosen by first ascertaining the occupations which figured most largely in the albuminuria cases in this group. The number of such occupations in the total 10,000 was then estimated.

So far as the numbers go, they give no indication that albuminuria or the presence of casts in the urine is of more frequent occurrence in one occupation than in another; further, no difference is obvious between "Sedentary" and "Active" groups.

The question is, however, complicated by various factors, such as previous disease, age, and length of time during which the individual had been engaged in the particular occupation. It is obvious, for instance, that a boy who had scarlet fever in youth and was suffering from nephritis as the result, would, on choosing an occupation, be more likely to take up tailoring or some such light work rather than that of an ironworker or mason.

The results in the 10,000 men investigated here are recorded in the following tables. Tables XXII and XXIII show the incidence of albuminuria, and Tables XXIV and XXV the incidence of casts. Grades of albuminuria and varieties of casts are indicated.

TABLE XXII.—Incidence of Albumin in Men of Different Occupations (Sedentary Occupations without much Exposure).

Occupation	Number of men in each occupation	Number of men in each occupation with albuminuria	Percentage of men in each occupation with albuminuria	Grade of albuminuria					
				A	B	C	D	N	NN
Baker	115	8	7·0	—	—	—	4	1	3
Butcher	112	8	7·1	—	—	—	3	3	2
Clerk	666	36	5·4	—	2	2	19	6	7
Clothworker ..	608	31	5·0	1	2	2	12	6	8
Grocer	201	21	10·4	—	1	—	8	6	6
Packer	70	3	4·3	—	—	1	1	1	—
Printer	83	4	4·8	—	—	2	1	1	—
Shoemaker	137	13	9·5	—	—	—	4	3	6
Shop Assistant ..	82	8	9·7	—	1	—	1	4	2
Steward	57	7	12·3	—	—	1	1	3	2
Student	20	3	15·0	—	—	1	1	1	—
Tailor	158	13	8·2	1	—	1	3	4	4
Warehouseman ..	210	9	4·3	—	—	—	2	4	3

TABLE XXIII.—Incidence of Albumin in Men of Different Occupations (Active Occupations with good deal of Exposure).

Occupation	Number of men in each occupation	Number of men in each occupation with albuminuria	Percentage of men in each occupation with albuminuria	Grade of albuminuria					
				A	B	C	D	N	NN
Carpenter	186	15	8·3	—	—	1	4	7	3
Carter	313	21	6·7	1	—	1	6	9	4
Collier	761	68	8·9	—	2	6	24	17	19
Coster	9	3	33·3	—	1	—	1	1	—
Engineman ..	143	12	8·4	—	—	—	5	3	4
Farmers, etc. ..	692	64	9·3	1	2	1	20	24	16
Gardener	131	9	6·8	—	—	—	2	5	2
Horseman	216	15	6·9	—	—	1	4	5	5
Ironworker	467	29	6·2	1	1	2	7	9	9
Labourer	771	46	9·8	—	2	4	15	14	11
Mason	36	11	30·6	—	2	—	3	2	4
Painter	159	18	11·3	1	2	—	11	2	2
Postman	52	3	5·8	—	—	—	—	2	1
Plumber	52	4	7·7	1	—	—	1	2	—
Railwayman ..	162	10	6·2	—	—	1	6	3	—
Smith	72	11	15·3	—	—	1	3	3	4
Sailor	40	6	15·0	—	—	2	3	1	—

TABLE XXIV.—Incidence of Casts in Men of Different Occupations (Sedentary Occupations without much Exposure).

Occupation	Number of men in each occupation	Number of men in each occupation with casts	Percentage of men in each occupation with casts	Nature of casts	
				Epithelial	Hyaline
Baker	115	3	2·6	2	1
Butcher	112	2	1·8	1	1
Clerk	666	9	1·3	5	4
Clothworker	608	12	1·9	5	7
Grocer	201	2	1·0	1	1
Packer	70	2	2·8	2	—
Printer	83	3	3·6	—	3
Shoemaker	137	3	2·2	3	—
Shop Assistant	82	5	6·1	3	2
Steward	57	4	7·0	2	2
Student	20	1	5·0	1	—
Tailor	158	8	5·1	6	2
Warehouseman	210	2	1·0	2	—

TABLE XXV.—Incidence of Casts in Men of Different Occupations (Active Occupations with good deal of Exposure).

Occupation	Number of men in each occupation	Number of men in each occupation with casts	Percentage of men in each occupation with casts	Nature of casts	
				Epithelial	Hyaline
Carpenter	186	5	2·6	2	3
Carter	313	6	1·9	4	2
Collier	761	4	0·5	4	—
Coster	9	1	11·1	—	1
Engineman	143	3	2·1	1	2
Farmers, etc.	692	17	2·4	7	10
Gardener	131	5	3·8	2	3
Horseman	216	3	1·4	—	3
Ironworker	467	7	1·5	5	2
Labourer	771	19	2·5	8	11
Mason	36	2	5·5	2	—
Painter	159	5	3·1	4	1
Postman	52	1	1·9	1	—
Plumber	52	2	3·8	1	1
Railwayman	162	3	1·9	1	2
Smith	72	1	1·4	—	1
Sailor..	40	3	7·5	3	—

(6) Relation of Length of Service to Incidence of Albuminuria and of Casts.

One of the most important features of the present investigation was to ascertain whether or not the general conditions associated with training for active service tended to have a detrimental effect on kidney efficiency as indicated by the ordinary examination. It is almost certain that any appreciably injurious effect on the renal system brought about by training would be indicated by an increase in albuminuria if not in the incidence of casts as well. The longer the soldier had been in training the greater should be the amount of albumin found. The importance of ascertaining definitely the effects of training is obvious, since we have here the total result of many factors, such as exposure, severe exercise, food, etc. If it were found that albuminuria steadily increased with the length of service, it would be necessary to analyse these different factors and find out if possible the particular cause of the condition.

Fortunately, the problem of the relation of training to kidney efficiency no longer presents any difficulty.

Training has no influence whatever either in increasing albuminuria or in causing existing albuminuria to become more marked.

Further, the incidence of casts does not increase with length of training.

The evidence on which these statements are based is supplied in the following tables, in which a fairly complete analysis of the different figures obtained is given.

The men examined were Nos. 3, 4, and 5 groups already referred to, each group consisting of 10,000 men. No account was taken of men with less than three months' service, since the numbers in this category were too small to be of any importance. Owing to this cause, and the fact that it was impossible, in a very few cases, to ascertain the exact period of service, the actual numbers

indicated in each group always fall a little short of 10,000. The total number of men actually examined in this investigation on the effect of training amounted to 29,607. The various tables explain themselves. For each group of approximately 10,000 men the total period of service up to thirty-six months is given. Those with a longer period of service than thirty-six months are grouped together, while, as already stated, the few with two months or under are omitted. The total amount of albumin, as well as the incidence of well-marked albumin and of casts, is given for each period.

Reference to Table XXVI shows that the average number per 1,000 suffering from albuminuria in men of from three to seven months' service was 69. For each successive period of five months the numbers are exceedingly close, being 69, 71, 68, 73, 62, and 61 per 1,000. There is neither an increase nor appreciable decrease of total albuminuria with length of training, but the incidence remains practically constant. This would seem to show that training plays no part in etiology of this albuminuria, and the probability is that the same incidence exists in civil life. This point was investigated at Aldershot, and is referred to later.

TABLE XXVI.—Incidence of Total Albuminuria, Well-marked Albuminuria (A, B, C, D Grades), and of Casts in Three Groups of Men at Different Periods of Training. (Total number of men investigated = 29,607.)

Period of training in months, inclusive	Number of men	Total Albuminuria				Well-marked Albuminuria				Casts			
		Average per 1,000			Average	Average per 1,000			Average	Average per 1,000			Average
		1st group	2nd group	3rd group		1st group	2nd group	3rd group		1st group	2nd group	3rd group	
3 to 7	4,820	62	68	79	69	27	33	43	34	13	17	43	24
8 to 12	4,121	85	57	66	69	34	30	30	31	31	20	30	27
13 to 17	3,743	82	62	69	71	26	27	37	30	27	23	37	29
18 to 22	3,175	78	53	73	68	38	24	31	31	16	14	31	20
23 to 27	2,875	66	78	77	73	30	39	40	36	20	34	40	31
28 to 32	2,660	64	68	54	62	38	37	32	35	14	22	32	22
33 and over ..	8,213	61	61	61	61	28	28	30	29	18	19	30	22

It might be argued, however, that an increase in the *total* albuminuria might not be expected, since the kidneys which were susceptible to the condition under discussion would have been already injured in the first two months of training before the men came to France. It might also be argued that kidneys which were not affected in the early period of training were not susceptible, and were sufficiently resistant to withstand any injurious factors associated with training.

On this hypothesis an increase in the total albuminuria would not be expected; but, on the other hand, an increase in the severity of the albuminuria in cases already affected would certainly be looked for. The severity of the albuminuria, however, does not increase. Taking the grades A, B, C, D, as indicating well-marked albuminuria, the average numbers exhibiting this degree of albuminuria in successive periods of five months' training are 34, 31, 30, 31, 36, 35 and 29 per 1,000. Here again there is neither increase nor decrease, but a constant incidence.

Apparently, Service conditions neither originate albuminuria to any appreciable extent nor do they aggravate already existing albuminuria.

Further, the number of urines containing casts remain practically constant during training, the figures for successive periods of five months being 24, 27, 29, 20, 31, 22, and 22 per 1,000.

These results give a final answer to the question of the effect of severe conditions, as seen during training on the incidence of albuminuria and of casts.

It appears fairly certain that training is not responsible for the production of any injurious renal effects, for if training entailed conditions actually detrimental to the kidney, one would, at least, expect some increase in the severity of pre-existing albuminuria.

TABLE XXVII.—Relation of Length of Service to Total Albuminuria in Third Group of 10,000 Men.

Length of service in months	Number of men with albuminuria in given period of service	Total number of men with given period of service	Percentage with albuminuria after given period of service
3	26	458	5·7
4	46	802	5·7
5	18	333	5·4
6	28	365	7·7
7	16	200	8·0
8	14	164	8·5
9	9	178	5·0
10	33	359	9·4
11	23	251	9·1
12	42	429	10·2
13	12	215	5·5
14	29	325	8·9
15	24	233	10·3
16	16	230	6·9
17	17	184	9·2
18	32	411	7·7
19	12	135	8·8
20	17	231	7·3
21	12	146	8·2
22	9	123	7·3
23	4	62	6·4
24	35	494	7·1
25	4	59	6·7
26	5	95	5·2
27	7	119	5·9
28	8	83	9·6
29	5	62	8·1
30	23	338	6·8
31	8	137	5·8
32	11	233	4·7
33	11	211	5·2
34	15	250	6·0
35	22	271	8·1
36	52	690	7·5
37 and over	44	786	5·6

No doubt, after severe and sudden exertion protein does appear in the urine. as indicated in Table XXI, but it seems to be a merely transitory phenomenon which soon disappears on resting; it does not appear to exhibit any tendency to become permanent even after thirty-six months or more of training. Pre-existing albuminuria, also, may be aggravated after severe exercise, but the fact that severe albuminuria is not more common after thirty-six months' service than it

is after three months, indicates that in these cases as well this increase is transitory; on resting, the albuminuria soon returns to its old level.

Various other considerations which have an important bearing on the question from the clinical standpoint might be discussed, but are deferred to a future occasion.

Tables XXVII to XXXI deal with the third group of 10,000 men mentioned at an early part of this paper. They indicate the total albuminuria and well-marked albuminuria for each month of service; also the number of urines found to contain casts and the incidence of albuminuria and of casts for periods of five months' service.

Tables XXXII to XXXVI deal with the fourth group, and Tables XXXVII to XL with the fifth group of 10,000 men.

The closeness of the corresponding figures in each group is striking and definitely shows that the investigation was on a sufficiently large scale to give reliable results.

TABLE XXVIII.—Relation of Length of Service to Well-marked Albuminuria (A, B, C, D Grades) in Third Group of 10,000 Men.

Length of service in months	Number of men with well-marked albuminuria (A, B, C, D grades) in given period of service	Total number of men with given period of service	Percentage with well-marked albuminuria (A, B, C, D grades) after given period of service
3	10	458	2·2
4	23	802	2·8
5	8	333	2·4
6	13	365	3·6
7	5	200	2·5
8	7	164	4·2
9	7	178	4·0
10	9	359	2·5
11	12	251	4·7
12	13	429	3·0
13	3	215	1·4
14	9	325	2·8
15	8	233	3·5
16	5	230	2·2
17	6	184	3·2
18	15	411	3·6
19	8	135	5·9
20	7	231	3·0
21	5	146	3·4
22	5	123	4·0
23	1	62	1·6
24	13	494	2·6
25	2	59	3·4
26	4	95	4·2
27	5	119	4·2
28	4	83	4·8
29	5	62	8·0
30	14	338	4·1
31	4	137	2·9
32	5	233	2·1
33	6	211	2·8
34	5	250	2·5
35	9	271	3·3
36	26	690	3·8
37 and over	17	786	2·1

TABLE XXIX.—Incidence of Total Albuminuria and of Well-marked Albuminuria (A, B, C, D Grades) in Third Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Total Albuminuria		Well-marked Albuminuria	
		Total number of men suffering from albuminuria of all grades in each period	Average per 1,000	Total number of men suffering from well-marked albuminuria (A, B, C, D grades) in each period	Average per 1,000
3 to 7 months inclusive	2,158	134	62	59	27
8 ,, 12 ,, ,,	1,381	121	85	48	34
13 ,, 17 ,, ,,	1,187	98	82	31	26
18 ,, 22 ,, ,,	1,046	82	78	40	38
23 ,, 27 ,, ,,	829	55	66	25	30
28 ,, 32 ,, ,,	853	55	64	32	38
33 ,, 37 ,, and over	2,208	144	61	63	28

TABLE XXX.—Relation of Length of Service to Presence of Albumin and Casts in Third Group of 10,000 Men Examined.

Length of service in months	Total number of men with given period of service	Number with casts		Average with casts per 1,000
		Epithelial	Hyaline	
3	458	3	5	17
4	802	2	1	4
5	333	5	1	18
6	365	6	2	22
7	200	2	1	20
8	164	3	3	4
9	178	4	—	36
10	359	2	6	22
11	251	4	5	36
12	429	7	9	37
13	215	4	2	28
14	325	5	2	21
15	233	5	3	34
16	230	2	3	21
17	184	3	3	32
18	411	5	5	24
19	135	2	—	15
20	231	—	1	5
21	146	2	2	27
22	123	—	—	—
23	62	—	1	16
24	494	4	8	24
25	59	1	—	17
26	95	1	—	1
27	119	1	1	2
28	83	—	2	17
29	62	—	1	16
30	338	4	3	20
31	137	—	—	—
32	233	1	1	8
33	211	2	3	23
34	250	1	1	8
35	271	2	4	22
36	690	5	9	20
37 and over	786	1	12	17

TABLE XXXI.—Incidence of Casts in Third Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Number of men with casts in each period	Average per 1,000
3 to 7 months inclusive ..	2,158	28	13
8 ,, 12 ,, ,, ..	1,381	43	31
13 ,, 17 ,, ,, ..	1,187	32	27
18 ,, 22 ,, ,, ..	1,046	17	16
23 ,, 27 ,, ,, ..	829	17	20
28 ,, 32 ,, ,, ..	853	12	14
33 ,, 37 ,, and over ..	2,208	40	18

TABLE XXXII.—Relation of Length of Service to Total Albuminuria in Fourth Group of 10,000 Men.

Length of service in months	Number of men with albuminuria in given period of service	Total number of men with given period of service	Percentage with albuminuria after given period of service
3	13	221	5·9
4	19	295	6·3
5	15	199	7·5
6	27	325	8·3
7	14	258	5·4
8	13	217	6·0
9	13	182	7·1
10	15	274	5·5
11	15	253	5·9
12	21	434	4·8
13	7	193	3·6
14	23	314	7·3
15	18	330	5·5
16	27	297	9·1
17	8	202	4·0
18	20	410	4·9
19	11	165	6·6
20	15	199	7·5
21	8	172	4·6
22	7	214	3·2
23	7	107	6·6
24	44	583	7·5
25	3	77	4·0
26	11	109	10·0
27	16	156	10·0
28	10	151	6·6
29	6	91	6·6
30	28	336	8·3
31	9	113	8·0
32	8	199	4·0
33	17	169	10·0
34	16	216	7·4
35	7	160	4·4
36	66	1,303	5·0
37 and over	71	1,047	6·8

TABLE XXXIII.—Relation of Length of Service to Well-marked Albuminuria (A, B, C, D Grades) in Fourth Group of 10,000 Men.

Length of service in months	Number of men with well-marked albuminuria (A, B, C, D grades) in given period of service	Total number of men with given period of service	Percentage with well-marked albuminuria (A, B, C, D grades) after given period of service
3	7	221	3·1
4	9	295	3·0
5	6	199	3·0
6	13	325	4·0
7	8	258	3·1
8	9	217	4·1
9	4	182	2·2
10	6	274	2·2·
11	11	253	4·3
12	11	434	2·5
13	3	193	1·5
14	9	314	2·9
15	11	330	3·3
16	10	297	3·4
17	3	202	1·5
18	11	410	2·7
19	3	165	1·8
20	7	199	3·5
21	4	172	2·3
22	3	214	1·4
23	2	107	1·9
24	25	583	4·3
25	3	77	4·0
26	3	109	2·8
27	8	156	5·1
28	6	151	3·8
29	2	91	2·2
30	17	336	5·0
31	5	113	4·4
32	3	199	1·5
33	9	169	5·3
34	5	216	2·3
35	3	160	1·9
36	28	1,303	2·1
37 and over	35	1,047	3·3

TABLE XXXIV.—Incidence of Total Albuminuria and of Well-marked Albuminuria (A, B, C, D Grades) in Fourth Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Total Albuminuria		Well-marked Albuminuria	
		Total number of men suffering from albuminuria of all grades in each period	Average per 1,000	Total number of men suffering from well-marked albuminuria (A, B, C, D grades) in each period	Average per 1,000
3 to 7 months inclusive	1,298	88	68	43	33
8 ,, 12 ,, ,,	1,360	77	57	41	30
13 ,, 17 ,, ,,	1,336	83	62	36	27
18 ,, 22 ,, ,,	1,160	61	53	28	24
23 ,, 27 ,, ,,	1,032	81	78	41	39
28 ,, 32 ,, ,,	890	61	68	33	37
33 ,, 37 ,, and over	2,895	177	61	80	28

TABLE XXXV.—Relation of Length of Service to Presence of Albumin and Casts in Fourth Group of 10,000 Men Examined.

Length of service in months	Total number of men with given period of service	Number with casts		Average with casts per 1,000
		Epithelial	Hyaline	
3	221	—	4	18
4	295	3	2	17
5	199	2	2	20
6	325	—	6	19
7	258	2	1	11
8	217	3	1	19
9	182	3	1	22
10	274	3	5	29
11	253	2	2	16
12	434	3	5	19
13	193	1	2	16
14	314	6	6	38
15	330	2	5	21
16	297	2	5	23
17	202	1	2	15
18	410	2	4	15
19	165	2	2	24
20	199	1	3	20
21	172	1	—	7
22	214	—	1	5
23	107	2	1	28
24	583	9	12	36
25	77	2	1	39
26	109	2	—	18
27	156	3	3	38
28	151	4	—	26
29	91	—	1	11
30	336	5	4	27
31	113	3	2	44
32	199	1	—	5
33	169	2	4	36
34	216	1	4	23
35	160	1	1	12
36	1,303	6	13	14
37 and over	1,047	11	10	20

TABLE XXXVI.—Incidence of Casts in Fourth Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Number of men with casts in each period	Average per 1,000
3 to 7 months inclusive ..	1,298	22	17
8 ,, 12 ,, ,, ..	1,360	28	20
13 ,, 17 ,, ,, ..	1,336	32	23
18 ,, 22 ,, ,, ..	1,160	16	14
23 ,, 27 ,, ,, ..	1,032	35	34
28 ,, 32 ,, ,, ..	890	20	22
33 ,, 37 ,, and over ..	2,895	50	19

TABLE XXXVII.—Relation of Length of Service to Total Albuminuria in Fifth Group of 10,000 Men.

Length of service in months	Number of men with albuminuria in given period of service	Total number of men with given period of service	Percentage with albuminuria after given period of service
3	3	68	4·4
4	5	133	3 8
5	4	205	1·9
6	15	217	6·9
7	81	741	11·0
8	29	345	8·4
9	15	157	9·6
10	10	160	6·2
11	20	268	7·5
12	18	450	4·0
13	15	223	6·7
14	17	245	7·0
15	15	215	7·0
16	22	364	6·0
17	15	173	8·1
18	23	343	6·7
19	12	162	7·4
20	12	156	7·7
21	7	139	5·0
22	17	169	10·0
23	7	87	8 0
24	45	575	7·8
25	5	94	5·3
26	11	104	10·5
27	10	154	6·5
28	9	171	5·2
29	2	105	1·9
30	25	381	6·6
31	4	98	4·1
32	10	162	6·1
33	11	206	5·3
34	14	215	6·5
35	4	112	3·5
36	77	1,241	6·2
37 and over	86	1,336	6·4

TABLE XXXVIII.—Relation of Length of Service to Well-marked Albuminuria (A, B, C, D Grades) in Fifth Group of 10,000 Men.

Length of service in months	Number of men with well-marked albuminuria (A, B, C, D grades) in given period of service	Total number of men with given period of service	Percentage with well-marked albuminuria (A, B, C, D grades) after given period of service
3	2	68	2·9
4	1	133	0·8
5	2	205	1·0
6	10	217	4·6
7	44	741	5·9
8	17	345	4·9
9	6	157	3·8
10	3	160	1·8
11	9	268	3·3
12	7	450	1·5
13	7	223	3·1
14	10	245	4·1
15	9	215	4·2
16	10	364	2·8
17	10	173	5·8
18	11	343	3·2
19	3	162	1·8
20	4	156	2·6
21	4	139	2·9
22	8	169	4·7
23	5	87	5·7
24	21	575	3·6
25	5	94	5·3
26	4	104	3·9
27	6	154	3·8
28	5	171	2·8
29	1	105	0·9
30	14	381	3·7
31	4	98	4·0
32	5	162	3·0
33	7	206	3·4
34	9	215	4·2
35	2	112	1·8
36	37	1,241	3·0
37 and over	38	1,336	2·8

TABLE XXXIX.—Incidence of Total Albuminuria and of Well-marked Albuminuria (A, B, C, D Grades) in Fifth Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Total Albuminuria		Well-marked Albuminuria	
		Total number of men suffering from albuminuria of all grades in each period	Average per 1,000	Total number of men suffering from well-marked albuminuria (A, B, C, D grades) in each period	Average per 1,000
3 to 7 months inclusive	1,364	108	79	59	43
8 ,, 12 ,, ,,	1,380	92	66	42	30
13 ,, 17 ,, ,,	1,220	84	69	46	37
18 ,, 22 ,, ,,	969	71	73	30	31
23 ,, 27 ,, ,,	1,014	78	77	41	40
28 ,, 32 ,, ,,	917	50	54	29	32
33 ,, 37 ,, and over	3,110	192	61	93	30

TABLE XL.—Relation of Length of Service to Presence of Albumin and Casts in Fifth Group of 10,000 Men Examined.

Length of service in months	Total number of men with given period of service	Number with Casts		Average with casts per 1,000
		Epithelial	Hyaline	
3	68	1	—	14
4	133	—	—	—
5	205	—	2	10
6	217	1	8	41
7	741	6	11	23
8	345	1	6	10
9	157	4	3	44
10	160	11	1	75
11	268	1	6	26
12	450	1	4	11
13	223	1	5	27
14	245	2	6	32
15	215	3	5	37
16	364	6	3	25
17	173	3	4	40
18	343	2	4	17
19	162	3	3	37
20	156	1	2	19
21	139	1	1	14
22	169	2	4	36
23	87	1	—	11
24	575	2	10	21
25	94	—	2	21
26	104	2	3	48
27	154	—	4	26
28	171	—	2	11
29	105	1	—	9
30	381	1	3	10
31	98	1	—	10
32	162	1	2	18
33	206	2	5	34
34	215	—	4	19
35	112	—	1	9
36	1,241	4	19	18
37 and over	1,336	7	17	19

TABLE XLI.—Incidence of Casts in Fifth Group of 10,000 Men for each Successive Period of Five Months' Training.

Period of training	Number of men in each period	Number of men with casts in each period	Average per 1,000
3 to 7 months inclusive ..	1,364	21	16
8 ,, 12 ,, ,, ..	1,380	20	14
13 ,, 17 ,, ,, ..	1,220	23	19
18 ,, 22 ,, ,, ..	969	14	14
23 ,, 27 ,, ,, ..	1,014	19	19
28 ,, 32 ,, ,, ..	917	7	8
33 ,, 37 ,, and over ..	3,110	46	15

(To be continued.)

Reviews.

PRINCIPLES OF GENERAL PHYSIOLOGY. By William Maddock Bayliss, M.A., D.Sc., F.R.S. Second Edition revised. London: Longmans, Green, and Co. 1918. Pp. xxiv and 858, $9\frac{3}{4} \times 5\frac{1}{2}$. Price 24s. net.

One of the consequences of the present conditions is that books sent for review fall at times into the hands of confident persons whose sole qualification is interest in the subject with which they deal—an interest not supported by any extensive or accurate knowledge of its literature. Some books lend themselves to the more detached consideration of the reviewer indifferently equipped with special knowledge, who has sufficient general knowledge of the greater whole of which the special subject forms a part, to express some opinion concerning the appropriate niche in which the work should be placed.

Professor Bayliss's volume is distinguished from all others of which the present reviewer has any knowledge in that physiology is taken as a branch of general physics, and the treatment of the subject is on those lines familiar to all students of modern work in pure science. One has often wondered how long we were to wait for the treatment in this way of a subject which has usually been dealt with in a manner showing definite evidence of descent from the days in which histology was the important element, through stages in which the facts, but not the great principles, of physical science were stated, often with obviously imperfect understanding. In working over a special subject in that dim era before the War, it was curious to see how underlying general principles were not only neglected but concealed by mode of presentation of the facts. Professor Bayliss's book shows that among investigators a new spirit has arisen which will lead to great developments, not only in methods but in results.

The indifferent qualifications of the reviewer render it impossible for him to venture with the smallest advantage upon any detailed criticism. For the same reason he finds it difficult to place, one is tempted to say categorize, the book. Professor Bayliss postulates a considerable knowledge of various sciences, including pure mathematics, and it is obvious that no reader who has not access to a well-equipped special library can get the full value out of this book. It is not a student's text-book for which one has to offer up thanks; it appears destined more for the investigator, possibly the super-physiologist. It is not systematic, in the sense that one can look up a subject and find all about it on consecutive pages. This is outside its aim. But it is difficult to conceive a more stimulating discussion of the larger questions of physiology viewed as a part of the mosaic of general physics.

It has been found by the reviewer a most fascinating book, not least because the author, like John Ruskin, has delightful asides which are at times only just relevant to the point under discussion. Both prefaces should be read carefully; one comes to the surface with a desire to know more of Claude Bernard. The portraits of famous physiologists add to the interest, and the book is otherwise well illustrated. The paper, no doubt, is bad, owing to the present conditions, which affects the reproduction of the engravings. But the print is legible and only appearance, possibly also permanence, suffers, while the positive advantage of the light weight of the volume more than makes up for these small defects.

R. J. S. S.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

October, 1918.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
September 12, 1918.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign :—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS AND MEDALS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

ORDER OF THE CROWN OF ITALY.

Bronze Medal for Military Valour.

20720 Pte. William Alfred Boyes, Royal Army Medical Corps (Special Reserve), (St. Helens, Lancashire).

437381 Pte. (Acting Cpl.) William Harold Chick, Royal Army Medical Corps (Birmingham).

Italian Bronze Medal, "della Salute Publica."

Capt. John James Harkness Beckton, Royal Army Medical Corps.

ORDER OF ST. MAURICE AND ST. LAZARUS.

Cavalier: Major George William Webb Ware, D.S.O., M.B., Royal Army Medical Corps.

ORDER OF THE CROWN OF ITALY.

Officer: Col. Robert Wallace Wright, C.M.G., Royal Army Medical Corps.

September 13, 1918.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Non-commissioned Officers and Men :—

461233 Lance-Cpl. A. Goddard, M.M., Royal Army Medical Corps (Gosport).

65716 Pte. (Acting Cpl.) W. Clouston, M.M., Royal Army Medical Corps (Caterham Valley).

405267 Pte. (Acting Lance-Cpl.) H. Carter, M.M., Royal Army Medical Corps (Sheffield). (M.M. gazetted February 23, 1918.)

M1/06774 (Acting Cpl.) J. H. Weatherley, M.M., Army Service Corps (M.T.), attd. Royal Army Medical Corps (Barnes). (M.M. gazetted July 16, 1918.)

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for bravery in the Field to the undermentioned Non-commissioned Officers and Men :—

ROYAL ARMY MEDICAL CORPS.

403582 Pte. (Acting Lance-Cpl.) D. Arnold (Woodhouse, Leeds).
56630 Pte. J. Barnes (Ealing).
433076 Pte. F. B. Beale (Moreton-in-Marsh)
89036 Pte. L. Bell (Ashington).
32025 Pte. G. Beresford (Walsall).
403163 Pte. R. E. Bolton (Leeds).
405272 Pte. (Acting Lance-Cpl.) W. Briggs (Sheffield).

46014 Pte. C. Brookling (Treharris).
40493 Pte. J. Carter (Eastleigh).
42430 Pte. (Acting Cpl.) G. Cartwright (Flixton).
316236 Pte. G. Corlett (Glasgow).
71849 Pte. C. S. Cox (Burnley).
401039 Serjt. A. Daniels (Newsam, nr. Leeds).
405019 Pte. (Acting Lance-Cpl.) F. Dent (Sheffield).
401391 Pte. A. Dickinson (Leeds).
48666 Pte. E. Douglas (Wrexham).
7763 Pte. J. Farrell (Dublin).
66189 Pte. W. J. Ford (Clutton, nr. Bristol).
40166 Serjt. T. P. Fowler (East Bethnal Green).
534218 Pte. H. E. Freshwater (East Finchley).
72519 Pte. G. C. Gardner (Northampton).
403576 Lance-Serjt. A. Geairns (Wheatbottom, co. Durham).
50403 Pte. (Acting Lance-Cpl.) G. Gilpin (South Shields).
364374 Pte. A. Grahame (Newport, Monmouthshire).
405152 Pte. E. Gregory (Sheffield).
52008 Pte. (Acting Lance-Cpl.) S. A. Grimes (Ipswich).
401024 Pte. T. B. Haley (Leeds).
536311 Pte. (Acting Lance-Cpl.) W. A. Harry (Newport, Monmouthshire).
401090 Cpl. (Acting Lance-Serjt.) P. Harvey (Halifax).
405133 Pte. A. C. Hayward (Sheffield).
403549 Pte. (Acting Lance-Cpl.) H. Hill (Leeds).
405147 Pte. J. H. Jenkinson (Sheffield).
8047 Pte. W. Johnston (Houghton-le-Spring).
403591 Pte. W. Kellett (Leeds).
88389 Pte. A. Law (Glasgow).
330088 Pte. (Acting Cpl.) J. P. Lees, attd. Yorkshire Light Infantry (Aberdeen).
337 Pte. J. Loxley (Glasgow).
53548 Serjt. E. G. Lumgair (Cowdenbeath).
405199 Pte. H. Maris (Sheffield).
42504 Pte. G. A. McLennan (Methil).
866 Pte. D. Murphy (East Liverpool).
53486 Pte. J. W. Partis, (Seaton Delavel).
32479 Pte. (Acting Lance-Cpl.) W. Seaward (Brixham).
433036 Pte. G. C. B. Sidwick (Edgbaston).
102518 Pte. S. Skeat (Tydesley).
73000 Pte. L. Stevenson (Nottingham).
403338 Pte. (Acting Lance-Cpl.) P. R. Todd (Knaresborough).
2213 Pte. (Acting Cpl.) J. J. S. Ward (Richmond).
60418 Pte. B. Whitely (Halifax).

War Office,
September 24, 1918.

His Majesty the King has been graciously pleased to approve of the following awards to the undermentioned Officers and Warrant Officers, in recognition of their gallantry and devotion to duty in the Field :—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Major (Temp. Lieut.-Col.) Albert Richard Henchley, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an enemy attack. In two days he succeeded in evacuating some 1,500 patients. He got away his personnel and lorries under shell and machine-gun fire, and proceeded to a hospital elsewhere from which he evacuated 300 wounded by ambulance trains. His unit was the last to leave the town. His coolness and resource were the means of saving a large number of wounded from falling into the hands of the enemy.

AWARDED A BAR TO THE MILITARY CROSS.

Capt. (Acting Major) Roger Errington, M.C., M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an enemy attack. He remained in his dressing station under machine-gun fire until it was evacuated. He then took another dressing station and again under machine-gun fire evacuated all patients. It was entirely due to his coolness and devotion to duty that these wounded did not fall into the hands of the enemy. (M.C. gazetted January 14, 1916.)

Temp. Capt. Paul MacDonald Little, M.C., M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in attending to wounded in the front line under heavy shell, machine-gun and rifle fire. His example of coolness and devotion to duty caused a large number of wounded to be successfully evacuated from the front line. (M.C. gazetted September 26, 1916.)

Temp. Capt. Alan Cowan Mann, M.C., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an enemy attack. Hearing that a number of wounded had been left in a dressing station, he organized bearer parties and led them through heavy shell fire to the dressing station and evacuated all the wounded. Through his devotion to duty many wounded were cleared who would otherwise have been abandoned. (M.C. gazetted July 26, 1918.)

Capt. (Acting Major) Robert Taylor, M.C., Royal Army Medical Corps (Special Reserve).

For conspicuous gallantry and devotion to duty while in command of an advanced dressing station. He worked with untiring energy, attending to and supervising the loading on to cars of all cases. The dressing station was hit several times, and eventually came under machine-gun fire, but he succeeded in clearing all wounded. He showed fine determination and devotion to duty. (M.C. gazetted August 16, 1917.)

AWARDED THE MILITARY CROSS.

Capt. Alfred Lang Bodley, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. When a dug-out was heavily shelled and blown in he rescued a man from the most dangerous place where three men lay buried, and attended to the men affected, assisting to get them away. In one case he tried for hours to save a man who had lost consciousness, and during this time lost consciousness himself, but continued his work on recovering. His personal example of courage was of the utmost assistance.

Temp. Capt. William Cooper, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an enemy attack. He was unremitting in his attention to wounded under fire, and stayed behind in a village with a small salvage party attending to a number of wounded and gassed officers and men who came in. He behaved splendidly.

Temp. Capt. Guy de Hoghton Dawson, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. During an arduous period of retirement, lasting for some days, he worked with unflagging energy in attending to the wounded under heavy fire, evacuating them successfully, on one occasion when the enemy were within 40 yards of the rear aid post. His example helped and encouraged all those under his command.

Capt. (Acting Major) Robert Alfred Greenwood, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in evacuating the wounded. When a bridge was blocked and partly submerged by a fallen tree he supervised the clearing, and helped to carry the wounded across under heavy shell fire on both banks. Though severely shaken by a shell bursting and partially burying him, he carried on until all the wounded were safely across the canal.

Temp. Capt. Norman McAlister Gregg, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during a raid. He untiringly attended to the wounded under heavy enemy fire until the last man was cleared, and showed great coolness and devotion to duty. He worked persistently throughout the raid in the open, and searched for any wounded that might have been overlooked. He behaved splendidly.

Capt. Henry Taylor Lamb, Royal Army Medical Corps (Special Reserve.)

For conspicuous gallantry and devotion to duty when an outpost company were suffering numerous casualties from enemy bombardment. He proceeded to the locality at once, and under heavy shelling got all the wounded moved to shelter, remaining with the company until the bombardment ceased. During a trying time he showed splendid devotion to duty.

Temp. Capt. William Lumsden, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. While in charge of bearers carrying wounded over an exposed hill-side swept by shell and machine-gun fire he saw a bearer fall. He at once ran to him and dressed his wounds, after which he remained with him until dusk, the man being unable to walk. He then assisted him across country to a place of safety. His conduct was splendid.

Capt. (Acting Major) Kenneth Arly Porterfield Rynd Murray, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in charge of an advanced dressing station during an enemy attack. He worked continuously for two days, often under heavy shell fire, and evacuated over 200 cases. Owing to the constant change of position he had great difficulty in keeping touch with the medical officers of the regiments he was clearing, and only succeeded in doing so by visiting them all personally on several occasions. His courage and magnificent devotion to duty set a fine example to all his men.

Temp. Lieut. Thomas Gordon Playford, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. Assisted by an orderly, he dressed the wounds of several officers on the roadside under heavy shell fire. Later, he established a dressing station in a village which was rapidly being enveloped by the enemy, and succeeded in clearing all his casualties before it was evacuated.

Lieut. (Acting Major) Raymond Stowers, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in command of an advanced dressing station subjected for hours to heavy shelling. He got all cases away in a most expeditious manner. Subsequently, on the near approach of the enemy, he got his personnel and cars away and opened a temporary dressing station elsewhere, and continued to evacuate wounded till ordered to retire. He showed fine devotion to duty.

Capt. Cecil McLaren West, Royal Army Medical Corps (Special Reserve).

For conspicuous gallantry and devotion to duty. On three occasions he went through heavy shell fire to attend casualties in batteries which were under fire, the roads all the time being heavily shelled with high explosives, shrapnel and gas shells.

Capt. (Acting Major) Maurice Ulick Wilson, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an attack. He continually attended wounded at the advanced dressing station which was constantly under artillery fire (four shells

dropped within a few yards of the operating table). The work was continued without cessation, so that 247 cases were evacuated in thirty-eight hours. He showed fine devotion to duty under very difficult circumstances.

Canadian Force.

Capt. Christopher Matheson Finlayson, Army Medical Corps.

For conspicuous gallantry and devotion to duty. During a raid on the enemy's positions he worked at the advanced aid post with the greatest gallantry and unselfish courage. Later, he withdrew to the fixed rear aid post and performed valuable duties.

Australian Imperial Force.

Capt. James Iver McIver Chirnside, Army Medical Corps.

For conspicuous gallantry and devotion to duty while attending to wounded men under heavy shell and machine-gun fire. During the retirement of the rearguard squadron he attended to the wounded while the enemy were firing at a distance of 300 yards. He showed great devotion to duty.

Capt. John Eric McGlashan, Army Medical Corps.

For conspicuous gallantry and devotion to duty in charge of the evacuation of wounded during an attack. He visited his various posts under heavy shell and machine-gun fire, and was largely responsible for the successful evacuation of the wounded.

Capt. Hugh Compson Trumble, Army Medical Corps.

For conspicuous gallantry and devotion to duty. Under heavy enemy barrage he pushed forward some 600 yards with his medical personnel to a ledge, where by his capable organization he successfully evacuated quantities of wounded. He worked for three days and nights, and his quiet courage had an excellent effect on wounded and stretcher-bearers alike.

AMENDMENTS.

The following is the correct description of an Officer upon whom a reward has recently been conferred:—

Major (Temp. Lieut.-Col.) R. M. Barron, Indian Medical Service. (*London Gazette*, dated March 26, 1918.)

The following should be added to the announcement in the *London Gazette*, No. 30563, dated March 8, and No. 30856, dated August 22, 1918, against the name of Qmr. and Major G. Merritt, South African Medical Corps: Retired Pay, late Royal Army Medical Corps.

October 3, 1918.

His Majesty the King has been graciously pleased to approve of the award of the Distinguished Conduct Medal to the undermentioned Non-commissioned Officers and Men, for gallantry and distinguished service in the Field:—

390005 Qmr.-Serjt. F. Bell, Royal Army Medical Corps (Hull).

For conspicuous gallantry and devotion to duty when with a party which was carrying twenty wounded men by hand and it was fired on by a party of the enemy which had advanced to about fifty yards from it. With admirable coolness he led his party through houses and then through a forest to a place of safety, and was undoubtedly the cause of saving both personnel and wounded from capture.

9657 Serjt. A. Bradley, Royal Army Medical Corps (Curragh Camp).

For conspicuous good work and devotion to duty. This Non-commissioned Officer led his stretcher parties and safely brought in all wounded under very heavy fire in action.

457394 Pte. E. Clemens, Royal Army Medical Corps (Cardiff).

For conspicuous gallantry and devotion to duty during an enemy attack. He went again and again through heavy shell fire to bring dressings and instruments from a dressing station. For four days he worked without rest, attending to the wounded under very trying conditions, and showed fine devotion to duty.

48703 Pte. J. Davies, Royal Army Medical Corps (Tylorstown, Glamorganshire).

For conspicuous gallantry and devotion to duty. This private was the only European assistant with Lieut. Burnet, R.A.M.C. He acted as his right-hand man, either with stretcher parties or in the dressing station, and remained out all night attending to some wounded who could not be moved till next morning. Later, he was assisting Lieut. Burnet at an amputation when the attack with rifles and machine guns took place on the camp, and, although bullets were traversing the tent, he remained steadily at his post. He has already shown good service and devotion to duty.

457033 Serjt. C. Hancock, Royal Army Medical Corps (Exeter).

For conspicuous gallantry and devotion to duty in a heavy gas shell bombardment of an advanced dressing station which was struck repeatedly by shells. For thirty-six hours he worked under very difficult conditions, attending to the wounded and supervising the evacuation, and thanks to him the evacuation of a great many casualties was rapidly carried out.

38441 Pte. P. Short, Royal Army Medical Corps (South Hylton).

For conspicuous gallantry and devotion to duty. When he was out with a party of stretcher bearers he went to the assistance of a number of wounded, who had collected at a post which was under heavy shell fire, and managed to evacuate them all, though the area was beyond the locality to which his duty would have taken him in his ordinary course. On another occasion when the stretcher squad of another division all became casualties, he and a private went for 300 yards under an intense barrage to the assistance of the wounded, one of whom he gave his box respirator, covering his own mouth with his handkerchief at a great risk of being gassed. His action was a fine example of unselfish devotion to duty and much courage.

386188 Serjt. R. W. Smith, M.M., Royal Army Medical Corps (Gateshead).

For conspicuous gallantry and devotion to duty when from the moment an enemy bombardment started he moved about freely in the open collecting and attending to the wounded. After the advanced dressing station had been evacuated, he made repeated attempts to see if any wounded had been left behind, the road being all the time swept by machine gun and shell fire. For three days this Non-commissioned Officer continued to do the same work, setting a magnificent example of courage and devotion to all who came in contact with him.

25593 Pte. (Acting Cpl.) F. Watts, M.M., Royal Army Medical Corps (Oxford).

For conspicuous gallantry and devotion to duty. This Non-commissioned Officer led a party of stretcher bearers to the rescue of a detachment whose dug-outs had been completely demolished by shell fire. After four hours' hard work, which was carried on under the direct observation of the enemy and a heavy bombardment with high explosives and large calibre shells, he succeeded in rescuing the three survivors, the saving of whose lives was due to his fine initiative, coolness and complete disregard for his own safety.

Australian Imperial Force.

310A Cpl. Eatcock, Australian Army Medical Corps.

For conspicuous gallantry and devotion to duty in carrying and dressing several wounded men, under machine-gun and shell fire. At night he went out with a party of stretcher bearers, and personally saw that every wounded man was brought in, going out on several occasions in front of the line and nearly up to the enemy's trenches. All through the action he worked gallantly and rendered distinguished service, going out repeatedly under heavy fire to bring in wounded.

South African Force.

2213 Pte. E. H. Anderson, South African Medical Corps.

For conspicuous gallantry and devotion to duty and coolness under fire when his commanding officer and six others were hit and he himself was suffering from high fever at the time.

6019 Assistant Surgeon A. B. Hamilton, East African Medical Service.

For conspicuous gallantry and devotion to duty. This Warrant Officer has done consistently fine work in every action he has been in. He is invariably sent forward with the bearer parties to relieve the regimental aid stations, and at work of this kind he cannot be surpassed. It has been due largely to his resource and coolness that the wounded have always been safely and quickly transferred from the firing line to the ambulance. He has been so employed in every action, and in two of them was under very heavy fire.

1123 Cpl. E. F. M. Kaschula, South African Medical Corps.

For conspicuous gallantry and devotion to duty. He did continuous good work, which has generally been of a high class, but he did especially well on one occasion when in charge of a post, displaying resource, initiative, and zeal.

2004 Serjt. H. G. Reynolds, South African Medical Corps.

For conspicuous gallantry and devotion to duty. This Non-commissioned Officer has done most excellent work in the past eighteen months in two separate areas. In every action at which he has been present he has set a very high example of coolness under fire, and by his conduct in treating the sick and wounded.

AMENDMENTS.

The following is the correct description of the Non-commissioned Officer to whom the Distinguished Conduct Medal has been recently awarded.

16165 Qmr.-Serjt. (Temp. Serjt.-Major) Bullough, Royal Army Medical Corps, attached South African Medical Corps. (*London Gazette*, August 22, 1918.)

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.

October 4, 1918.

His Majesty the King has been graciously pleased to give orders for the following promotion in and appointment to the Most Excellent Order of the British Empire for services in or for the Oversea Dominions, Colonies and Protectorates, in connexion with the War. The appointment to date from June 3, 1918 :—

DOMINION OF NEW ZEALAND.

To be Officer of the said Most Excellent Order :—

Lieut.-Col. Arthur Stanley Herbert, New Zealand Medical Corps, for special services in connexion with military hospitals at Rotorna.

War Office,
October 7, 1918.

The names of the undermentioned have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with Military operations in Hedjaz :—

STAFF.

Royal Army Medical Corps.

Major W. McConaghy.
Temp. Capt. W. N. Montgomery, M.B.
106191 Private E. Genner.

The following have been mentioned in dispatches for valuable special services on the Mediterranean Lines of Communication :—

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. M. B. Arnold, M.D.
Capt. B. A. Odlum.
528118 Pte. (Acting Serj.) D. R. Evans.
527858 Pte. (Acting Cpl) F. Fletcher.
528294 Lance-Cpl. E. Hargreaves.
105 Staff-Serjt. F. Newman, D.C.M.
18675 Staff-Serjt. A. C. Partridge.
527134 Staff-Serjt. J. R. Thomas.

ADDITIONAL MENTIONS IN DISPATCHES.

The names of the undermentioned Officers are to be added to those brought to notice for distinguished and gallant services and devotion to duty by Field Marshal Sir Douglas Haig, K.T., G.C.B., G.C.V.O., K.C.I.E., Commander-in-Chief of the British Armies in France, in his dispatch of April 7, 1918. (Published in the Supplements of the *London Gazette*, Nos. 30691, 30693, 30698, 30701, 30704, and 30706, of May, 1918) :—

Lieut. (Temp. Capt.) W. H. Ferguson, Royal Army Medical Corps (Special Reserve).
Temp. Capt. A. C. Mann, M.C., Royal Army Medical Corps, attached S.W. Bord.
Col. R. M. Simpson, Canadian Army Medical Corps.

The names of the undermentioned Officers are to be added to those brought to notice for distinguished and gallant services and devotion to duty by Gen. Sir E. H. H. Allenby, G.C.M.G., K.C.B., Commander-in-Chief of the Egyptian Expeditionary Force, in his dispatch of April 3, 1918. (Published in the Supplement of the *London Gazette* dated June 14, 1918, No. 30746) :—

ROYAL ARMY MEDICAL CORPS.

Temp. Major J. J. Abraham, M.D., F.R.C.S.
Lieut.-Col. (Temp. Col.) G. A. T. Bray.
Major (Temp. Lieut.-Col.) M. Dunning, M.B.
Col. E. G. R. Evatt, M.B.
Capt. (Acting Lieut.-Col.) E. C. Lambkin, M.B.
Temp. Lieut.-Col. H. Wade, M.D., F.R.C.S.

The names of the undermentioned Officers are to be added to those brought to notice for distinguished services by Lieut.-Gen. Sir J. L. Van Deventer, K.C.B., Commander-in-Chief of the British Forces in East Africa, in his dispatch of January 21, 1918. (Published in the Supplement of the *London Gazette* dated August 6, 1918, No. 30829) :—

Lieut.-Col. R. T. Brown, D.S.O., M.B., Royal Army Medical Corps.
Major (Temp. Lieut.-Col.) P. S. Clarke, South African Medical Corps.
Capt. T. S. Dunn, East African Medical Service.
Temp. Major W. J. Gow, Royal Army Medical Corps.
Major R. S. Kennedy, M.C., M.B., Indian Medical Service.
Capt. (Acting Lieut.-Col.) J. A. Manifold, M.B., Royal Army Medical Corps.
Lieut.-Col. P. W. O'Gorman, Indian Medical Service.

The undermentioned Officer has been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the War :—

Major-Gen. W. G. A. Bedford, C.B., C.M.G., M.B., Army Medical Service.

AMENDMENTS TO MENTIONS IN DISPATCHES.

The undermentioned are now correctly described :—

London Gazette, dated May 25, 1918 (No. 30704).

Temp. Col. H. A. Ballance, Army Medical Service.
Col. (Temp. Major-Gen.) B. M. Skinner, C.B., C.M.G., M.V.O., Army Medical Service, Headquarters Staff.
Lieut.-Col. (Temp. Col.) W. Thorburn, C.B., M.D., F.R.C.S. (Consultants).
Temp. Capt. F. R. Wilson, M.B., Royal Army Medical Corps, attached West Riding Reserves, is substituted for Qmr. and Hon. Capt. F. Wilson, Royal Army Medical Corps.

London Gazette, dated May 28, 1918 (No. 30706).

Major D. M. Embelton, Australian Army Medical Corps (Staff).

London Gazette, dated March 12, 1918 (No. 30570).

Capt. J. Ewing, Royal Army Medical Corps.

London Gazette, dated May 30, 1918 (No. 30711).

Temp. Capt. A. E. Thompson, M.C., M.D., Royal Army Medical Corps.

London Gazette, dated June 11, 1918 (No. 30740).

92433 Pte. W. R. Morris, Royal Army Medical Corps.
81787 Pte. R. R. Williams, Royal Army Medical Corps.

War Office,
October 10, 1918.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for Distinguished Services during the course of the campaign.

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

LÉGION D'HONNEUR.

Croix de Guerre.

Temp. Capt. John Beattie McFarland, M.C., Royal Army Medical Corps.
350049 Sergt. Richard Scowcroft, Royal Army Medical Corps (Bradshaw, near Bolton).

Croix de Chevalier.

Col. Henry Raymond Casgrain, Canadian Army Medical Corps.
Hon. Major Charles Frederick Skipper, Canadian Army Medical Corps.

Croix de Guerre.

Capt. (Acting Major) Edward Richardson Lovell, Royal Army Medical Corps (Special Reserve).
Capt. Mervyn John Holmes, Australian Army Medical Corps.
Major (Acting Lieut.-Col.) Henry Horace Andrews Emerson, D.S.O., M.B., Royal Army Medical Corps.
Capt. Samuel Russell Foster, M.C., M.B., Royal Army Medical Corps.
Major (Temp. Lieut.-Col.) William John Saundry Harvey, D.S.O., Royal Army Medical Corps.
Major (Temp. Lieut.-Col.) Frederick Duke Gwynne Howell, D.S.O., M.C., Royal Army Medical Corps.
Capt. Peter McEwan, M.B., F.R.C.S., Royal Army Medical Corps.
Major (Acting Lieut.-Col.) Philip Janvrin Marett, Royal Army Medical Corps.
Qmr. and Hon. Capt. Robert Daniel Matthews, M.C., Royal Army Medical Corps.
Col. (Temp. Major-Gen.) Samuel Guise Moores, C.B., C.M.G.
Capt. (Acting Major) John James McIntosh Shaw, M.C., M.B., Royal Army Medical Corps, Special Reserve.
Capt. (Acting Major) William Leckie Webster, M.B., Royal Army Medical Corps.
407078 Pte. Edward Francis Exon, Royal Army Medical Corps (Bradford).
10529 Serjt. Edward Selwyn Holmes, Australian Army Medical Corps.
Temp. Capt. Alexander Beck Cluckie, M.B., Royal Army Medical Corps.

DECORATION CONFERRED BY THE PRESIDENT OF THE PORTUGUESE REPUBLIC.

Military Order of Avis, 2nd Class.

Major William Henry Gerard Herbert Best, Royal Army Medical Corps, Special Reserve.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HELLENES.

Order of the Redeemer, 2nd Class, Grand Commander.

Surg.-Gen. Sir Hayward Reader Whitehead, K.C.B., F.R.C.S.

Order of the Redeemer, 3rd Class, Commander.

Lieut.-Col. Arthur Russell Aldridge, C.B., C.S.I., C.M.G., M.B. (Reserve of Officers), Royal Army Medical Corps.

Order of the Redeemer, 5th Class, Cavalier.

Captain John Percy Litt, M.D., Royal Army Medical Corps.

Order of the Sacred Treasure, 3rd Class.

Col. Thomas John Rashleigh Lucas, C.B., M.B., retired pay.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Corrections, London Gazette, September 10, 1918.

The award of the Order of the White Eagle, 4th Class, to Lieut.-Col. Charles Henry Straton, Royal Army Medical Corps, should be amended to read "Order of St. Sava, 4th Class."

War Office,
October 7, 1918.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Non-commissioned Officers and Men :—

38887 Pte. J. Miller, M.M., Royal Army Medical Corps (Wigan). (M.M. gazetted January 20, 1917.)

1330 Pte. (Acting Lance-Cpl.) J. Wilson, M.M., Royal Army Medical Corps (East Southampton).

457355 Cpl. (Acting Lance-Serjt.) G. E. Essex, M.M., Royal Army Medical Corps (Exminster).

337100 Serjt. A. N. Morgan, M.M., Royal Army Medical Corps (Liverpool).

46783 Pte. E. Haynes, M.M., Royal Army Medical Corps (Hunslet).

47173 Pte. E. Davis, M.M., Royal Army Medical Corps (Sidlesham). (M.M. gazetted July 16, 1918.)

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for Bravery in the Field to the undermentioned Non-commissioned Officers and Men :—

ROYAL ARMY MEDICAL CORPS.

45510 Serjt. (Acting Staff-Serjt.) H. W. Abbiss, D.C.M. (Overstrand).
55403 Pte. J. D. Anderson (South Shields).
341242 Pte. R. Bates (St. Helens).
337641 Pte. H. J. Beamer (Liverpool).
390082 Lance-Cpl. R. B. Boynton (Hull).
917 Pte. (Acting Serjt.) A. H. Davis (Roscrea).
341207 Pte. E. Foster (St. Helens).
337056 Pte. G. Fraser (Dewsbury).
337532 Pte. E. Gleave (St. Helens).
8315 Pte. F. Green (Pimlico).
57364 Pte. W. T. Hemming (Birmingham).
12947 Staff-Serjt. (Acting Serjt.-Major) M. Henderson (Belfast).
337728 Pte. H. Heywood (Bolton).
63803 Pte. H. Hilton (Rochdale).
341391 Cpl. G. Hogan (St. Helens).
19855 Pte. (Staff-Serjt.) E. Kerr (Bethnal Green).
101171 Pte. (Acting Serjt.) W. R. Knaggs (Whitby).
1267 Pte. J. W. Lanty (Rotherham).
72528 Pte. W. E. Lowell (Wellingboro').
36594 Pte. P. McElhoney (Lenwood).
473192 Pte. W. P. Meredith (Eastbourne).
102672 Pte. J. Miller (Preston).
421127 Pte. N. Morrell (Wolverhampton).
337320 Pte. P. Morris (Liverpool).
341337 Pte. G. Moss (Southport).
473104 Pte. H. A. Mutimer (Ipswich).
124816 Pte. E. J. Owen (Aberdare).
461392 Serjt. R. N. Parkin (Chester-le-Street).
63565 Pte. C. Pilling (Horwich).
388256 Pte. J. Robson (Cockfield).
426028 Serjt. J. D. Rouse (Leicester).
659 Serjt. L. T. Rousell (Sheffield).
38403 Pte. M. Rowell (Sunderland).
493173 Cpl. S. E. Russell (Snodham).
337596 Pte. J. Sampson (Liverpool).
457386 Pte. R. Selway (Exeter).
341104 Pte. H. Shard (Widnes).
538443 Cpl. R. J. Shepherd (Leytonstone).
457324 Lance-Cpl. J. Slade (Swindon).
303254 Pte. A. Smith (Culter).
28140 Pte. G. A. Stables (Liversedge).
457378 Pte. H. Stocker (Exeter).
20061 Pte. E. Strangeways (Newcastle-on-Tyne).
18253 Qmr.-Serjt. (Acting Serjt.-Major) J. Suter (Dover).
337326 Pte. T. B. Sye (Liverpool).
30321 Pte. A. Thackery (Broughton-in-Furness).
463055 Pte. W. Thorne (Highampton).
103087 Pte. H. H. Towers (Bury).
426003 Staff-Serjt. W. A. Towers (Leicester).
437458 Pte. L. Wilson (Northfield).
4767 Pte. G. Young (Whitburn).

AMENDMENTS.

The following are the correct descriptions of Men whose names have appeared in the *London Gazette* for the award of Military Medals :—

MILITARY MEDALS.

London Gazette dated July 16, 1918.

65313 Pte. W. J. Arnold, Royal Army Medical Corps.

London Gazette dated August 6, 1918.

69809 Pte. (Acting Lance-Cpl.) W. M. Foster, Royal Army Medical Corps.
43754 Pte. T. H. Uncles, Royal Army Medical Corps.
33180 Pte. (Acting Cpl.) F. Walley, Royal Army Medical Corps.

SIR WM. TAYLOR MEMORIAL FUND.

THE subscriptions collected from brother Officers and friends of the late Surg.-Gen. Sir William Taylor, K.C.B., amount to £84. The Committee decided that the Memorial should take the form of a Bronze Tablet with suitable inscription. The design was approved and placed in the hands of an artist early in the year. He now reports that he is unable to complete the work owing to the prohibition placed on obtaining the necessary metal. A good site was selected in the chancel at St. George's Church, Aldershot, and permission has been granted by the War Office for its erection. On completion of the Tablet, a small photograph, together with a list of the names of all subscribers will be sent to all subcribers.

Horse Guards Annexe,
12, Carlton House Terrace, S.W. 1.
October 1, 1918.

C. R. TYRRELL, *Colonel,*
Hon. Secretary.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

NOTICE.

THE Committee, with the concurrence of the Actuary, have reduced the extra war premium for married members from twenty-five to fifteen guineas per annum, in addition to the normal annual subscription according to scale. This concession is retrospective.

The extra premium is now payable only when the member proceeds overseas; so long as he is in this country he is charged the tabular premium only.

Unmarried members pay an annual subscription of £2, thereby reducing according to scale the amount of their subscription when they transfer to the married class.

The Secretary will be glad to give any further information as to the Fund.

SUMMARY OF THE PROCEEDINGS OF A MEETING OF THE COMMITTEE WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON OCTOBER 17, 1918.

Present:

Deputy Surg.-Gen. W. G. Don, Vice-President, in the Chair.
Major-Gen. W. S. M. Price, Vice-President.
Major-Gen. Sir H. R. Whitehead, K.C.B.
Lieut.-Col. P. S. O'Reilly, C.M.G.
Lieut.-Col. G. S. Mansfield.

---

(1) The Minutes of the Meeting of July 15, 1918, were read and confirmed.

(2) The acceptance of the appointment of Consulting Actuary by Mr. R. R. Tilt, F.I.A. having been reported, the Chairman expressed his pleasure thereat and introduced him to the Meeting.

The Committee considered a Report which, in accordance with a resolution adopted at the last meeting, had been submitted by the Actuary on the question of the reduction of the present extra war charge. The essential points in this Report were:—

(*a*) The Actuary concurred in a modification of the present terms for new entrants, subject to the condition that it remains open to the Committee to increase the charge, and close the Fund, to new entrants at any time during the war, and considered that the extra premium might be reduced from twenty-five to fifteen guineas per annum.

(*b*) He suggested that the extra premium be payable when the member proceeds abroad, charging him the tabular premium only so long as he is in this country.

(*c*) He recommended that if the Committee decide to reduce the extra premium the concession be made retrospective.

Proposed by Major-Gen. Sir H. R. Whitehead, seconded by Major-Gen. Price and carried unanimously, that the Actuary's Report be adopted, and that the recommendations therein be put into effect.

The half-yearly instalment of interest on £124,000 National War Loan five per cent 1929/47 being due on December 1, it was proposed by Major-Gen. Sir H. R. Whitehead, seconded by Lieut.-Col. O'Reilly and carried unanimously, that subject to the approval of the Trustees, on the receipt of this interest, available cash surplus, not exceeding £3,000, be invested in five per cent National War Bonds 1928, and that the Secretary be empowered to take the necessary steps.

(5) On the proposal of Major-Gen. Price, seconded by Lieut.-Col. O'Reilly it was resolved unanimously that such officers as may be gazetted to Regular Commissions in the Corps, up to the date of the meeting of the Committee next following this, be eligible for admission as married members of the Society at the present extra war charge of fifteen guineas per annum.

(6) Payment of annuities to the widows on the list which was submitted was sanctioned.

(7) The death was reported of an annuitant, Mrs. T. B. Moriarity: also of a member, Lieut.-Col. Eugenius A. Roche, whose widow was placed on the list.

(8) Payment of £2 2s. being proportion of fee due to the estate of the late Mr. H. W. Andras, F.I.A., was sanctioned.

(9) Payment of the Secretary's salary for the past quarter was sanctioned, also of office allowance and refund of petty cash expended.

3, *Homefield Road*,
Wimbledon, S.W. 19.
October 18, 1918.

J. T. CLAPHAM, *Captain*,
Secretary.

ROYAL ARMY MEDICAL CORPS OFFICERS BENEVOLENT SOCIETY.

MINUTES OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE, ON TUESDAY, OCTOBER 15, 1918.

Present:

Major-Gen. Sir W. Donovan, K.C.B., one of the Trustees, in the Chair.
Major-Gen. Sir M. W. Russell, K.C.M.G., Vice-President.
Major-Gen. Sir H. R. Whitehead, K.C.B.
Col. H. W. Murray.
Capt. J. T. Clapham.

(1) The Minutes of the meeting held on July 17 were read and confirmed.

(2) The Secretary reported that as a result of the special appeal made in accordance with the instructions of the Committee Meeting on February 27, 103 subscribers had now joined and 53 other officers had promised to join as from January 1, 1919, making a total of 156—also that the expenses of issuing the appeal had only amounted to £5 14s. 10d.

(3) The Secretary reported that the present cash balance at the bankers was £468 8s. 9d. and it was decided to invest a further sum of £200 in National War Bonds five per cent 1928 issue.

(4) Two cases of special appeal under Rule 24 were considered and it was decided to grant the orphan daughter of A. C. E. £20 for the purpose of starting her in a career, and £20 to the orphan children of K. M. C. in aid of their temporary requirements.

ROYAL ARMY MEDICAL CORPS FUND.

MINUTES OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE, OCTOBER 15, 1918.

Present:

Lieut.-Gen. T. H. J. C. Goodwin, C.B., C.M.G., D.S.O., K.H.S., Director-General, in the Chair.
Major-Gen. G. B. Stanistreet, C.B., C.M.G., Deputy Director-General.
Major-Gen. Sir W. Donovan, K.C.B.
Col. C. R. Tyrrell, C.B.
Major E. Offord.
Capt. E. B. Allnutt, M.C., Band President.

(1) The Minutes of the last meeting held on July 17 were read and confirmed.

(2) A letter of regret for non-attendance was read from Col. Sir J. Magill.

(3) The replies received from Senior Officers to the circular letter sent out under the instructions of the Committee at the Meeting held on July 17 relating to the Memorial to certain distinguished officers were read and considered, and it was proposed by Col. C. R. Tyrrell and seconded by Major-Gen. Sir W. Donovan that the names originally suggested should stand, and that the matter be referred to the Memorials Sub-committee for the necessary action.

(4) Correspondence relating to the selection of an artist to paint a special portrait of Lieut.-Gen. Sir A. Keogh was read and it was decided to request Mr. Arthur Hacker, R.A., to undertake the task at the cost agreed upon, viz., 400 guineas exclusive of the frame.

(5) Two cases of special distress were considered under Rule 5 and it was decided to continue the grant authorized by the Meeting held on July 17 to the widow of F. W. H. D. H. up to a total of £50. It was considered that the second case does not come within the scope of the Rule and the application was not approved.

(6) Five applications for assistance from the General Relief Branch were considered and the following grants were approved—

Mr. A. T. to receive the balance of the amount authorized by the meeting held on July 17, viz.	£3	0	0
Mr. W. F. C. and wife	6	0	0
Mr. J. R. S. and wife	2	0	0
Mr. T. P. (This case is referred to the Auxiliary R.A.M.C. Fund) ..	2	0	0
The widow of the late F. T. M.	6	0	0

ROYAL ARMY MEDICAL CORPS.

Band Fund.

Statement showing Receipts and Expenditure from April to September, 1918.

Income.	£	s.	d.
Balance brought forward	181	11	11
Fees for Performances on Victoria and Central Piers ..	54	0	0
	£235	11	11

Expenditure.	£	s.	d.
Salaries of Bandmaster, Band Serjeant and Storeman ..	79	13	0
Bandmaster and Men, Pay for Peformances on Victoria and Central Piers	32	10	0
Postage and Telegrams	0	7	2
Insurance	2	17	9
Bandmaster's Uniform	5	2	6
Repairs to Instruments	2	1	9
Music, Strings and Instruments	35	10	0
Balance in hand	77	9	9
	£235	11	11

Certified correct,

Blackpoool,
October 21, 1918.

E. B. ALLNUTT, *Captain R.A.M.C.,*
President, R.A.M.C. Band.

Certified that the accounts of the Depot, R.A.M.C., Band have this day been audited and found correct.

Blackpool,
October 10, 1918.

A. JACKSON, *Major R.A.M.C.*
A. HYNDMAN, *Lieutenant K.S.L.I.*

(7) The Secretary reported the present cash balances in both branches and it was decided to invest a further amount of £500 on account of the General Relief Branch in National War Bonds five per cent 1928 series.

(8) The Band President submitted the Band accounts for the past six months and a grant of £60 was authorized from the Officers Branch.

(9) The question of a grant to the Prisoners of War Fund from the General Relief Branch was considered and it was decided that it would be better to approach the Central Committee, 4, Thurloe Place, for assistance should it become necessary.

(10) An appeal was read from the Army and Navy Male Nurses' Co-operation and a grant of £20 authorized.

ROYAL ARMY MEDICAL CORPS PRISONERS OF WAR FUND.

OFFICIAL CARE COMMITTEE RECOGNIZED BY THE WAR OFFICE FOR THE ROYAL ARMY MEDICAL CORPS.

THE Honorary Treasurer has now the pleasure of submitting the fifth List of Contributions to the above Fund containing all subscriptions up to the middle of September, from Units at home and abroad. It will be noticed that many of these are renewed or additional donations, and several Units have generously promised grants to be repeated monthly, or as their general funds permit.

The Honorary Treasurer trusts that all Officers Commanding will impress upon the Committees of their Regimental Institutes where such exist, the necessity of supporting this Fund for the benefit of their comrades in captivity in order that the regular supply of parcels of food may be kept up. The large increase in the number of prisoners, now exceeding 1,100, and in the cost of provisions, entails a very large monthly expenditure, which has hitherto been met by the Corps itself and by numerous friends.

If subscriptions are not maintained an appeal for outside assistance will soon be unavoidable.

124, *Victoria Street, S.W.*
September 25, 1918.

E. M. WILSON, *Lieut.-Colonel,*
Hon. Treasurer.

FIFTH LIST.

LIST OF COMPANIES AND UNITS AT HOME AND ABROAD, CONTRIBUTIONS TO THE PRISONERS OF WAR FUND IN 1918.

July 25—			
Cliff Military Hospital	£3	8	0
July 29—			
No. 12 Field Ambulance ..	5	0	0
R.A.M.C. Depot, Blackpool ..	500	0	0
July 30—			
2nd London General Hospital (Chelsea)	41	3	6
August—			
R.A.M.C. School of Instruction (Officers), Blackpool	63	9	6
2nd Wessex Field Ambulance (T.F.)	40	0	0
Military Hospital, Fovant ..	5	0	0
30th General Hospital	36	15	0
No. 19 Company, Chester (further contribution)	50	0	0
Serjeant's Mess, No. 3 General Hospital	2	0	0
Queen Mary's Military Hospital, Whalley (further contribution)	25	0	0
7th Training Battalion, R.A.M.C., Blackpool	17	19	2
19th Field Ambulance	18	8	4
Military Hospital, Newhaven ..	9	9	0
24th General Hospital	3	14	0
2nd Wessex Field Ambulance (2nd donation)	40	0	0
2/2nd North Midland Field Ambulance (monthly contribution)	7	6	0
R.A.M.C. Mess, Sheerness ..	6	6	0
46th Stationary Hospital ..	33	0	0
50th Field Ambulance	3	3	0
Military Hospital Mess, Catterick and Regimental Institutes ..	£10	2	0
Detachment 1st Birmingham War Hospital, Kidnal ..	1	16	0
Detachment R.A.M.C., Gosport (3rd donation)	0	14	3
Lieut.-Col. H. P. and Mrs. Corkery, Central Hospital, Winchester	319	3	6
Lieut.-Col. H. E. Winter and No. 6 Company	20	0	0
4th Training Battalion, Blackpool	7	0	0
2nd Wessex Field Ambulance (3rd donation)	40	0	0
4th Northern General Hospital, R.A.M.C. (T.)	25	0	0
St. George's Garrison Church, Woolwich	20	0	0
5th Training Battalion, Blackpool	16	0	0
1st Training Battalion, Blackpool	5	0	0
6th Training Battalion, Blackpool	10	0	0
28th Field Ambulance	5	0	0
Provisional Company (now Reserve Battalion) Depot, Blackpool "Cough Drops" Concert Party	200	0	0
133rd British General Hospital, Mesopotamia, Regimental Institute	7	10	0

O.C. 6th Company (additional), Portsmouth	£5	2	0
No. 1 Duchess of Westminster's Hospital Wt., N.C.O.s and Men	16	0	0
No. 1 Duchess of Westminster's Hospital Regimental Funds ..	12	0	0
Convalescent Hospital, Holywood, County Down	5	0	0
44th Casualty Clearing Station..	7	7	2
29th Company, Jamaica (2nd donation)	1	0	0
4th Stationary Hospital ..	39	19	4
St. John Ambulance Brigade Hospital, France (630 fr.)	23	10	8
65th British General Hospital, Mesopotamia	5	0	0
53rd General Hospital, Serjeants' Mess	2	18	0
No. 6 Company (additional) ..	3	12	6
Serjeants' Mess, 3rd Native General Hospital, B.E.F., France	10	0	0
26th Company, Bermuda (further contribution)	1	5	0
Detachment, 8th Company, Middlesbrough, Yorkshire ..	2	0	0
3rd Training Battalion, Blackpool	5	0	0
No. 6 Company Detachment, Dorchester	1	5	6
No. 6 Company, Cosham (additional)	2	2	0
No. 6 Company Detachment, Alderney	0	10	0
No. 6 Company, Romsey ..	0	13	3
August 27—			
8th Training Battalion, Blackpool (monthly contribution) ..	5	0	0
2nd Training Battalion, Blackpool (annual in advance) ..	12	0	0
2/1st Wessex Field Ambulance..	6	4	1
August 30—			
R.A.M.C. Detachment, Christchurch, 6th Company.. ..	0	11	0
Nos. 12 and 34 Companies, Royal Herbert Hospital, Woolwich..	20	0	0
Nos. 12 and 34 Detachments, Warlingham	11	5	0
Nos. 12 and 34 Detachments, Dartford	10	0	0
76th Casualty Clearing Station (further donation)	0	12	0
6th Training Battalion, Blackpool	8	18	0
No. 20 Casualty Clearing Station	20	0	0
Officers No. 25 Casualty Clearing Station Wt., N.C.O.s and Men	25	0	0
Officers No. 25 Casualty Clearing Station, Salonika	47	0	0
No. 35 Company, R.A.M.C. ..	20	0	0
2nd Wessex Field Ambulance (4th donation)	50	0	0
R.A.M.C. Detachment, Bermuda (further subscription).. ..	1	0	0
No. 44 Casualty Clearing Station Officers, Sisters and other ranks	6	0	0
O.C. No. 6 Company, Cosham ..	43	4	9
O.C. No. 6 Company, Cosham ..	1	2	0
O.C. 1st Casualty Clearing Station	5	0	0
7th Training Battalion, R.A.M.C., Blackpool	20	3	2
No. 9 Company, Colchester (2nd subscription)	125	11	3
No. 12 Field Ambulance ..	5	0	0
42nd General Hospital, Salonika	30	10	0
55th Casualty Clearing Station	4	0	0
No. 6 Company, R.A.M.C. Detachment, Parkhurst, Isle of Wight	4	16	0
Cliff Military Hospital, Harwich (further donation)	2	2	3
8th Training Battalion, Blackpool	5	0	0
75th Field Ambulance (sports collection)	3	0	0
Croydon War Hospital	3	5	6
329th Field Ambulance.. ..	5	0	0
Detachment, R.A.M.C., Fort George	0	14	6
70th Sanitary Section	2	1	0
2/2nd North Midland Field Ambulance (monthly subscription)	7	6	0
Detachment, R.A.M.C., Jersey	0	11	0
2/1st Highland Field Ambulance	16	0	0
Regimental Funds, 1st Training Battalion, Blackpool	5	0	0
Mr. A. L. Martin and Staff Clerks. R.A.M.C., Salisbury	0	10	0
Detachment, R.A.M.C., No. 6 Company, Parkhurst, Isle of Wight (further contribution)..	0	10	6
3rd Training Battalion, Blackpool (monthly subscription) ..	5	0	0
49th General Hospital, Salonika	10	0	0
2nd Wessex Field Ambulance (additional)	30	0	0
R.A.M.C. Depot, Blackpool ..	400	0	0
Military Hospital, Woking ..	10	16	6
Kent County Comforts Fund, from Vice-Lieutenant ..	90	8	6
St. Thomas's Church, Shepherd's Bush	2	10	0

BIRTH.

LONG.—On September 16, at Sandhills, Reading Road, Fleet, Hants, the wife of Major H. W. Long, Royal Army Medical Corps, a daughter.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1918.

Title of Work and Author	Edition	Date	How obtained
The Diagnosis and Treatment of Venereal Diseases. By Lieut.-Col. L. W. Harrison, D.S.O., R.A.M.C.		1918	Library Grant.
Laboratory Manual for the Detection of Poisons and Powerful Drugs. By Dr. W. Autenrieth. Translated by W. H. Warren	4th	1915	,, ,,
Pathogenic Micro-organisms. By Park and Williams ..	6th	1917	,, ,,
Treatment of Joint and Muscle Injuries. By W. R. Bristow		1917	,, ,,
La Granulation Aurophile. Par le Dr. L. M. Bétanus ..		1918	Editor, Journal.
British Museum (Natural History). A Map showing the known Distribution in England and Wales of the Anopheline Mosquitoes. With Explanatory Notes and Text. By W. Dickson Lang, M.A.		1918	,, ,,
Notes on the Application of the Test of Organic Disease of the Spleen, as an easy and certain Method of detecting Malarial Localities in Hot Climates. By Surg. T. C. Dempster, 1848. Reprinted		1916	War Office, A.M.D.G.
Spud Wilkins at Blackpool. By Sergt. H. V. Verriss ..		1918	Editor, *R.A.M.C. Magazine.*
R.A.M.C. Magazine, July 5 to September 27		1918	The Editor.
Journal of the Royal Naval Medical Service, July ..		1918	,, ,,
London County Council. Report of the County Medical Officer of Health and School Medical Officer for the year 1917		1918	London County Council.
Medical Research Committee. Reports of the Special Investigation Committee on Surgical Shock and Allied Conditions, No. 5		1918	Medical Research Committee.
Reports of the Committee on War Nephritis, No. 3 ..		1918	,, ,,
Reports of the Chemical Warfare Committee, No. 8 ..		1918	,, ,,
Statistical Reports, No. 1		1918	,, ,,
Medical Research Institute, Lagos, Nigeria. Report for the year 1916. By A. Connal, M.D.		1918	The Director.
National Health Insurance. Medical Research Committee, Special Report Series, No. 18. An Investigation into the Epidemiology of Phthisis in Great Britain and Ireland		1918	War Office, A.M.D.G.
Special Report Series, No. 19. Reports of the Special Committee on the Standardization of Pathological Methods. The Laboratory Diagnosis of Gonococcal Infections. Methods for the Detection of Spirochætes		1918	,, ,,
The Montana State Board of Entomology :—			Presented by Surg.-
First Biennial Report, 1913-14		1914	Gen. Sir D. Bruce,
Second ditto, 1915-16		1916	K.C.B., F.R.S.
Archives of Neurology and Psychiatry. Vol. vii. Edited by F. W. Mott, M.D., LL.D., F.R.S.		1918	Presented by the Editor.
Two Addresses on War Psycho-Neurosis—(1) Neurasthenia. The Disorders and Disabilities of Fear. (2) The Psychology of Soldiers' Dreams. By F. W. Mott, M.D., LL.D., F.R.S.		1918	Presented by the Author.
Commonwealth of Australia. Department of Trades and Customs. Final Report on the Cause of Death and Invalidity in the Commonwealth		1918	Chairman of the Committee.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

Number of Reprints	Number of Pages	Cost of Reprints	Cost of EXCERPTS*	Extra for Covers for Reprints			
				As Journal, Printed on Front	As Journal, Plain, Unprinted	Cheaper Paper, Printed on Front	Cheaper Paper, Plain, Unprinted
		£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.
12	4	0 2 9	0 1 2	4 3	1 1	3 10	0 9
	8	0 5 0	0 2 3				
	16	0 8 3	0 3 11				
25	4	0 3 4	0 1 5	4 10	1 6	4 4	0 11
	8	0 6 0	0 2 9				
	16	0 10 6	0 5 0				
50	4	0 4 6	0 1 10	6 0	2 1	4 10	1 2
	8	0 7 6	0 3 6				
	16	0 13 3	0 5 10				
100	4	0 6 0	0 3 1	7 10	3 11	6 7	2 5
	8	0 10 0	0 4 10				
	16	0 18 6	0 7 6				
200	4	0 9 6	0 4 5	10 10	7 6	9 0	4 10
	8	0 15 0	0 6 7				
	16	1 6 0	0 9 8				

* These are not arranged as Reprints, but appear precisely as in the Journal with any other matter that may happen to appear on the first and last pages of the particular excerpt ordered.

Cases for Binding Volumes.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

Covers, 2s. 6d. net; binding, 2s. 6d.

These charges are exclusive of cost of postage.

In forwarding parts for binding the name and address of sender should be enclosed in parcel.

The above figures are subject to 25 per cent increase.

All Applications for Advertisements to be made to—

G. STREET & CO., Ltd., 8, Serle Steeet, London, W.C.

The back outside cover is not available for advertisements.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are

inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 324, Adastral House, Victoria Embankment, E.C.4.

Communications have been received from Major C. A. S. Ridout; Lieutenant G. T. P. Tatham.

The following publications have been received:—

British: The Journal of State Medicine, Tropical Diseases Bulletin, The Indian Medical Gazette, Journal of the United Service Institution of India, The Medical Press, The Medical Review, The Journal of Tropical Medicine and Hygiene, The Army Service Corps Journal, Bulletin of the Canadian Army Medical Corps, The Medical Journal of Australia, The Royal Engineers Journal, Journal of the Royal Naval Medical Service, Guy's Hospital Gazette, The Hospital, The Practitioner, Seale Hayne Neurological Studies, Report of Port of Sydney, Proceedings of the Royal Society of Medicine.

Foreign: United States Public Health Service, War Medicine, Tidskrift I Militär Hälsovard, Bulletin de l'Institut Pasteur, Giornale di Medicina Militare, Archives Medicales Belges, Archives de Médicine et Pharmacie Navales, The Journal of Infectious Diseases, Journal of Agricultural Research, Arquivos do Institute Bacteriologico, Camara Pestana, United States Department of Agriculture, Office International d'Hygiene Publique, Norsk Tidskrift for Militaermedicin, Bulletin of the Johns Hopkins Hospital, Archives de Medicine et de Pharmacie Militaires, Surgery, Gynæcology and Obstetrics.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," 25, Adastral House, Victoria Embankment, E.C. 4, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,
"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"
25, ADASTRAL HOUSE, VICTORIA EMBANKMENT, E.C.4.

℞ Syrupus Hypophosphitum Comp. FELLOWS

It is not unusual to meet the claim that other preparations are "just as good" as FELLOWS, but no one has met the preparation which rightly claimed to be better than FELLOWS. For over fifty years FELLOWS' SYRUP has maintained its supremacy as the standard preparation of the *Compound Hypophosphites.*

Reject < **Cheap and Inefficient Substitutes** / **Preparations "Just as Good"**

VALENTINE'S MEAT - JUICE

In **Typhoid** and other **Fevers, Extreme Exhaustion, Critical Conditions,** Before and After **Surgical Operations,** when Other Food **Fails** to be **Retained, Valentine's Meat-Juice** demonstrates its **Ease** of **Assimilation** and **Power** to **Restore** and **Strengthen.**

Clinical Reports from Hospitals and General Practitioners of Europe and America posted on application.

For sale by European and American Chemists and Druggists.

VALENTINE'S MEAT-JUICE CO.,

Richmond, Virginia, U. S. A.

B 190

VALENTINE'S
PREPARATION
NUTRIO FERME
MEAT JUICE.
The result of an original Process of Preparing Meat, and extracting its Juice by which the elements of nutrition are obtained in a state ready for immediate absorption.
DIRECTIONS-Dissolve one teaspoonful of the Preparation in two or three tablespoonfuls of cold or warm water. The use of boiling water changes the character of the preparation.

CONTENTS.

ORIGINAL COMMUNICATIONS. PAGE

An Attempt at Classification of *Bacillus Dysenteriæ*, Based upon an Examination of the Agglutinating Properties of Fifty-three Strains. By Captain E. G. D. MURRAY, R.A.M.C. 257

The Prophylaxis of Malaria. By Colonel G. T. RAWNSLEY, C.B., C.M.G., Lieutenant-Colonel R. A. CUNNINGHAM, R.A.M.C., and Captain J. WARNOCK, R.A.M.C. 272

Dysentery—A Clinical Study. By Lieutenant-Colonel JOHN M. COWAN, R.A.M.C., and Captain HUGH MILLER, R.A.M.C. 277

Castellani's Absorption Test. By Captain W. BROUGHTON ALCOCK, R.A.M.C. . 296

CLINICAL AND OTHER NOTES.

Lobar Pneumonia in a Base Hospital in France. By Captain ARCHIBALD MALLOCH, C.A.M.C., and Major LAWRENCE J. RHEA, C.A.M.C. . . 300

Notes on a Series of One Hundred and Sixty-one Cases of Gunshot Wounds of the Head Treated at No. 7 General Hospital, May to August, 1916. By Captains W. W. WAGSTAFFE and W. J. ADIE, R.A.M.C. . . . 307

A Note on the Value of Brilliant Green as an Antiseptic. By Captain C. H. S. WEBB, R.A.M.C. 315

Notes on an Outbreak of Phlebotomus Fever. By Captain J. A. HARTLEY, R.A.M.C. (T.F.) 317

REPORT.

An Investigation into the Incidence of Albuminuria and Casts in British Soldiers during Training and the Relationship of this Condition to War Nephritis. By Captain H. MACLEAN, R.A.M.C. 319

REVIEWS 338